EPA/ROD/R04-00/082
2000

EPA Superfund
Record of Decision:

CAMP LEJEUNE MILITARY RES. (USNAVY)
EPA ID: NC6170022580
OU 15
ONSLOW COUNTY, NC
09/27/2000

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960
SEP 26 2000

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

4WD-FFB

Commanding General
Building 1
Marine Corps Base
Camp Lejeune, North Carolina 28542

SUBJ: Interim Record of Decision
Operable Unit 14, Site 69
MCB Camp Lejeune NPL Site
Jacksonville, North Carolina

Dear Sir:

The U.S. Environmental Protection Agency (EPA) Region 4 has reviewed the above subject decision document and concurs with the interim selected remedy for the Remedial Action at Site 69. This remedy is supported by the previously completed Remedial Investigation, Feasibility Study and Baseline Risk Assessment Reports.

An Interim ROD rather than a Final ROD is being implemented at this time due to the reported presence of Chemical Warfare Materiel (CWM) at the site. Discussions with the Design Center for Ordnance and Explosives Team of the Department of the Army Corps of Engineers, have indicated that disposal of such materials is not readily available. EPA's concurrence on the IROD is based on the understanding that there will be a continuous effort to work with the Army Corps for removal of the CWM within the next five years and groundwater remediation will be implemented within five years.

The selected interim remedial actions address the principle threats associated with the contaminated media at Site 69. The major components of the selected remedy for the soils and groundwater include the following:

- Implementing a groundwater monitoring program targeting VOCs, CWM and inorganics.

- Implementing aquifer use controls to prohibit future use of the shallow and Castle Hayne aquifer within a 1,000 foot radius of the current groundwater plume.

• Implementing land use controls to restrict site access and use, and control intrusive activities.

• Filing a Notice of Inactive Hazardous Waste Site ("Notice") for Site 69 at the Onslow County Courthouse.

This remedial action, is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action and is cost effective.

EPA appreciates the coordination efforts of MCB Camp Lejeune and the level of effort that was put forth in the documents leading to this decision. EPA looks forward to continuing the exemplary working relationship with MCB Camp Lejeune and Atlantic Division Naval Facilities Engineering Command as we move toward a final cleanup of the NPL site.

Sincerely,

Richard D. Green, Director
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
Neal Paul, Camp Lejeune
Kirk Stevens, LANTDIV
Dave Lown, NCDEHNR

- Implementing land use controls to restrict site access and use, and control intrusive activities.

- Filing a Notice of Inactive Hazardous Waste Site ("Notice") for Site 69 at the Onslow County Courthouse.

This remedial action is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action and is cost effective.

EPA appreciates the coordination efforts of MCB Camp Lejeune and the level of effort that was put forth in the documents leading to this decision. EPA looks forward to continuing the exemplary working relationship with MCB Camp Lejeune and Atlantic Division Naval Facilities Engineering Command as we move toward a final cleanup of the NPL site.

Sincerely,

Richard D. Green, Director
Waste Management Division

cc: Elsie Munsell, Deputy Assistant Secretary of the Navy
Neal Paul, Camp Lejeune
Kirk Stevens, LANTDIV
Dave Lown, NCDEHNR

bcc: Allison Abernathy, HQ

GDT:gt:FFB:28538:8-17-00:OU14IROD.CON

Townsend 9/19 | Tucker | Bozeman CB for 9/19/00 | Johnston 9/25/00 | Green 9/27/00

FINAL INTERIM

RECORD OF DECISION
OPERABLE UNIT NO. 14
(SITE 69)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0212

JUNE 2000

Baker

FOSTER WHEELER ENVIRONMENTAL CORPC

WESTON
MANAGERS DESIGNERS/CONSULTANTS

FINAL INTERIM

RECORD OF DECISION
OPERABLE UNIT NO. 14
(SITE 69)

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0212

JUNE 2000

Prepared for:

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES
ENGINEERING COMMAND
Norfolk, Virginia

Under the:

LANTDIV CLEAN Program
Contract N62470-89-D-4814

Prepared by:

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ATTACHMENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AOC	area of concern
ARARs	Applicable and Relevant or Appropriate Requirements
Baker	Baker Environmental, Inc.
CAIS	chemical agent identification sets
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
COPCs	chemicals of potential concern
CWM	chemical warfare materiel
DCE	dichloroethene
DoN	Department of the Navy
DPVE	dual-phase vacuum extraction
FS	Feasibility Study
gpm	gallons per minute
HI	hazard index
HTH	high-test hypochlorite ("mustard gas")
IAS	Initial Assessment Study
ICR	incremental lifetime cancer risk
IR	Installation Restoration
LUC	Land Use Control
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
MCB	Marine Corps Base
MCL	Maximum Contaminant Level
NCAC	North Carolina Administrative Code
NC DENR	North Carolina Department of Environment and Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCWQS	North Carolina Water Quality Standard
NOAA	National Oceanic and Atmospheric Administration
"Notice"	Notice of Inactive Hazardous Substances or Waste Disposal Site
ORP	oxidation-reduction potential
OU	Operable Unit
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
ppt	parts per thousand
PRAP	Proposed Remedial Action Plan

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

RBC	risk-based concentration
RI	Remedial Investigation
RLs	remediation levels
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SSL	Soil Screening Level
TBC	to be considered
TCE	trichloroethene
TCL	Target Compound List
TS	Treatability Study
USEPA	United States Environmental Protection Agency
UVB	Unterdruck Verdampfer Brunnen
VOCs	volatile organic compounds
ZOI	zone of influence

DECLARATION

Site Name and Location

Operable Unit No. 14
(Site 69 - Rifle Range Chemical Dump)
Marine Corps Base
Camp Lejeune, North Carolina

Statement of Basis and Purposes

This decision document presents the selected interim remedy for Operable Unit (OU) No. 14 (Site 69) at Marine Corps Base (MCB), Camp Lejeune, North Carolina. The selected interim remedy for OU No. 14 was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for OU No. 14. This Interim Record of Decision (ROD) incorporates a site-specific Land Use Control Implementation Plan (LUCIP) for Site 69 in accordance with the Memorandum of Agreement dated May 24, 1999 known as the Land Use Control Assurance Plan (LUCAP).

The Department of the Navy (DoN) and the Marine Corps have obtained concurrence from the State of North Carolina Department of Environment and Natural Resources (NC DENR) on the selected remedy. A copy of the NC DENR approval letter dated April 14, 2000, is presented in Attachment E. Concurrence from the United States Environmental Protection Agency (USEPA) Region IV is anticipated. Formal USEPA Region IV concurrence is not provided until after the ROD is signed.

Assessment of the Site

Actual or threatened releases of hazardous substances from Site 69, if not addressed by implementing the response actions selected in this Interim ROD, may present potential threats to public health, welfare, or the environment.

An Interim ROD rather than a Final ROD is being implemented at this time due to the reported presence of Chemical Warfare Materiel (CWM) at the site. Records indicate that waste CWM was buried at the site. Monitoring for CWM was performed during the investigation with all intrusive activities for health and safety reasons; no CWM constituents were detected. Soil, sediment, and groundwater samples collected as part of the Remedial Investigation (RI) were analyzed for CWM degradation products. CWM degradation products were detected in the surface soil, and the on-site and drainage area sediment at several locations.

Based on discussions with the Design Center for Ordnance and Explosives Team of the Department of the Army Corps of Engineers, the unearthing of CAIS would require indefinite storage somewhere at MCB Camp Lejeune while waiting for final disposition. Currently, disposal of such materials is not readily available. Transportation and disposal at commercial facilities may soon be available for such wastes generated by military facilities. A concurrence letter from the Army Corps of Engineers is presented Attachment A.

Description of the Selected Remedy

The interim actions to be completed at OU No. 14 for Site 69 are Institutional Controls and Monitored Natural Attenuation.

The selected remedial actions included in this Interim ROD address the principle threats associated with contaminated media at Site 69. The interim remedy addresses the human health and ecological risks due to volatile organic compounds (VOCs) in groundwater and human safety risks due to buried CWM. Natural attenuation, monitoring, and controls on future use of the affected aquifers address the principle threat caused by VOC contaminated groundwater. Land use controls address the principle threats caused by soil contamination and possible presence of CWM. The interim remedy was not intended to address inorganic contaminants in groundwater. However, inorganic contaminants will be monitored and will be addressed further in a Final ROD, if necessary.

The provisions of this Interim ROD shall remain in effect until it is demonstrated that continued attainment of remedial goals has been achieved or until this Interim ROD is superseded by a Final ROD for the site. The major components of the selected remedy for the various media of concern at OU No. 14 include the following:

- Implementing a groundwater monitoring program targeting the VOCs of concern at the site. Natural attenuation processes are anticipated to reduce contaminants in groundwater over time. If remediation levels for groundwater are not achieved or substantial progress towards remedial goals cannot be documented, the alternatives for groundwater remediation will be reevaluated.

- Monitoring of CWM degradation products in groundwater in select wells.

- Monitoring of inorganics in groundwater in select wells.

- Implementing aquifer use controls to prohibit future use of the shallow and Castle Hayne aquifers within a 1,000 foot radius of the current boundary of groundwater VOC contamination at Site 69.

- Implementing land use controls which include controls on shallow and deep aquifer use (discussed above), controls on site access and use, and controls on intrusive activities. These controls are presented in the LUCIP which is included in this document as Attachment D.

- Filing a Notice of Inactive Hazardous Waste Site ("Notice") for Site 69 at the Onslow County Courthouse.

Statutory Determinations

The selected interim remedy will provide protection of human health by preventing exposure to potential contaminants and wastes at Site 69 through institutional controls and monitored natural attenuation. Institutional controls provide protection of human health by preventing exposure to potential contaminants in site media. Land use controls serve to prevent exposure to contaminated soil and the possible presence of CWM. Aquifer use controls prevent exposure to contaminated groundwater by controlling the use, other than for monitoring purposes, of the

contaminated groundwater by controlling the use, other than for monitoring purposes, of the aquifers within 1,000 feet of the identified groundwater plumes. It should be noted here that the installation of water supply wells that draw contaminated water from the plume, even if the wells are located outside the 1,000 foot buffer, are prohibited by North Carolina regulations. Natural attenuation processes are expected to reduce groundwater contaminant levels, and the associated monitoring program will track the success of such processes and plume movement.

The selected alternative will provide a permanent, long-term remedy through contaminant reduction and provision and enforcement of institutional controls in the base master planning process. In addition, the institutional controls for Site 69 will include recordation of a "Notice" with the Onslow County courthouse.

The selected interim remedy for Site 69 satisfies the preference for treatment by utilizing the alternative treatment technology of monitored natural attenuation. Currently, technological limitations due to the potential presence of CWM prevent the removal of the source of contaminants which may prohibit achievement of State and Federal groundwater standards. A waiver of Federal applicable or relevant and appropriate requirements (ARARs) is possible on the grounds that it may be technically impracticable to permanently restore the aquifers from an engineering perspective. However, any determination of this type is reserved for future application in the Final ROD only if appropriate.

Signature

29 JUN 2000

Date

Major General R.G. Richard
Commanding General
Marine Corps Base, Camp Lejeune

1.0 SITE NAMES AND LOCATIONS

Located in Onslow County, North Carolina, MCB, Camp Lejeune is a training base for the United States Marine Corps. The Base covers approximately 236 square miles and is bisected by the New River. The New River flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The southeastern border of MCB, Camp Lejeune is the Atlantic Ocean shoreline. The western and northeastern boundaries of the base are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville borders the base to the north.

The MCB, Camp Lejeune complex consists of six geographical locations under the jurisdiction of the Base Command. These areas include Camp Geiger, Montford Point, Courthouse Bay, Mainside, the Greater Sandy Run Area, and the Rifle Range Area. Site 69 is located within the Rifle Range Area.

OU No. 14 is one of 18 Operable Units located within MCB, Camp Lejeune. Figure 1 depicts the location of OU No. 14 within MCB, Camp Lejeune. As shown, OU No. 14 is located within the southwest portion of the base.

The remainder of this Interim ROD is divided into four main sections under the following headings:

- Site 69 - Rifle Range Chemical Dump
- Selected Remedy
- Statutory Determinations
- Responsiveness Summary

The first section of this Interim ROD presents pertinent information related to Site 69's history, previous investigations including nature and extent of contamination and summary of the site risks, scope and role of remedial action, description of the remedial action alternatives, and a summary of the alternative evaluation and comparative analysis. The second section identifies the selected remedy for Site 69. The statutory requirements are reviewed within the third section; and the fourth and final section documents all public comments as well as the DoN’s responses to the comments received.

All of the tables and figures presented within this Interim ROD are presented at the back of this document. A letter of concurrence acknowledging the conditions at Site 69 and a statement regarding the Army’s practice for CWM removal is presented in Attachment A. The transcript of the public meeting held to review the Proposed Remedial Action Plan (PRAP) on June 30, 1998 is presented in Attachment B. Soil to groundwater soil screening level calculations are shown in Attachment C. This Interim ROD also incorporates a site-specific LUCIP for Site 69 in accordance with the Memorandum of Agreement dated May 24, 1999 known as the LUCAP. The LUCIP is presented in Attachment D. In addition, the Interim ROD approval letter received from the NC DENR is incorporated by reference and is presented in Attachment E.

2.0 SITE 69 - RIFLE RANGE CHEMICAL DUMP

The following information will be presented: site description and history, previous investigations including nature and extent of contamination and summary of the site risks, scope and role of remedial action, summary of the remedial action alternatives, and evaluation of alternatives/comparative analysis.

2.1 Site Description and History

Figure 2 presents a site map of the Rifle Range Chemical Dump (Site 69). Site 69, the Rifle Range Chemical Dump, is located west of the New River in the area of MCB, Camp Lejeune known as the Rifle Range. The site is approximately 14 acres in size and is situated in a topographically high area. The area is overgrown to the point that the boundary of the former dump is not readily noticeable. Three surface water bodies are located within a quarter mile of the site: the New River to the east, an unnamed tributary of the New River to the north, and Everett Creek to the south. The site area is rather secluded. However, training exercises are conducted throughout the surrounding area. Currently, a fence surrounds the site to restrict access.

Site 69 has a reported history of CWM disposal as well as other chemical wastes. During the period 1950 to 1976, the area was used to dispose of chemical wastes including polychlorinated biphenyls (PCBs), solvents, and pesticides. Based on available documentation, the CWM suspected at Site 69 are chemical agent identification sets (CAIS) which contain calcium hypochlorite (an ingredient of mustard gas), high-test hypochlorite (HTH; also known as mustard gas), and other chemical agents.

CAIS were produced in large quantities (110,000 sets) and various configurations by the U.S. Army to train soldiers and sailors in the identification of actual chemical warfare agents and in the proper actions upon identification. The sets contain vials (ampules) or bottles of agent. The agents used in these sets could contain blister agents [mustard (H) and lewisite (L)], nerve agents (GA, GB, and VX), blood agents [hydrogen cyanide (AC) and cyanogen chloride (CK)], and choking agent [phosgene (CG)].

There are several different types of CAIS. Unfortunately, the types of CAIS used at MCB, Camp Lejeune are unknown. In addition, there is a lack of information to properly identify the quantity or disposal methods associated with the CAIS. With respect to disposal, it is not known whether the CWM was destroyed (via burning or detonation) prior to disposal. Existing information, however, does mention that drums were used during disposal. With respect to disposal of other chemical wastes, it is unknown if PCBs, solvents, and pesticides were buried in drums or directly dumped into trenches that exist at the site. Identification of the disposal actions could not be determined during the investigation because of the safety risks associated with the reported buried CWM.

2.2 Previous Investigations

Investigations conducted at Site 69 to date have focused on non-CWM contaminants based on historic disposal of chemical wastes (solvents, PCBs, pesticides, etc.) at the site. Monitoring for CWM was performed during the investigations with all intrusive activities for health and safety reasons, but no CWM was ever detected. However, the investigation was not intended to confirm or deny the presence of CWM.

A letter of concurrence regarding the current status of CWM remedial actions and limitations, as acquired from the U. S. Army Corps of Engineers, is provided in Attachment A.

Because the suspected CWM of concern at Site 69 are primarily CAIS and because of the remote location of Site 69, the Army has determined that Site 69 is a low priority site for CWM issues. The Army's current recommendation is to minimize disturbance of such sites until the time that

the Army has developed adequate tools to use in the assessment and remediation of such sites and has sufficient personnel to support investigation and clean-up efforts. Due to the Army's commitment to address high priority sites first, it is anticipated to be several years before Army support may be available. Therefore, the DoN's Installation Restoration (IR) Program response to date has been restricted to non-CWM investigations with appropriate Army assistance for health & safety issues only.

Pre-Remedial Investigation Studies

Previous investigations conducted under the DoN's IR Program during the late 1980s and early 1990s at Site 69 focused on shallow groundwater, surface water, and sediment. Eight shallow wells were installed (69-GW01-69-GW08) and only four surface water/sediment samples were collected. No soil samples were obtained prior to the RI. Shallow groundwater exhibited elevated levels of volatile organics in the southern portion of the site, primarily in monitoring well 69-GW02 and 69-GW03. The volatiles included 1,2-dichloroethene (DCE) (11,000 µg/L), trichloroethene (TCE) (67 µg/L), and vinyl chloride (36 µg/L). Surface water samples obtained from on-site standing water in low-lying areas of the site revealed the same constituents as were detected in shallow groundwater, but at much lower levels. These low-lying areas were located in the southern portion of the site near monitoring well 69-GW02.

Remedial Investigation

The RI field investigations were initiated in January 1994 and completed in April 1996. Data collected during the RI were evaluated to assess the extent of contamination in all site media and the potential for human health and ecological risks to occur based on current and future potential exposure at the site.

The following observations and conclusions were made during the RI.

- Shallow groundwater has been impacted with volatile organic compounds by former disposal operations. The VOC contamination, which is dominated by 1,2-DCE, is present in the southern portion of the site, near monitoring wells 69-GW02 and 69-GW15. In this area, VOCs are above Federal and State drinking water standards. VOCs also were detected in offsite shallow wells, but at much lower levels. Off-site contaminant levels are below Federal and State drinking water standards. The horizontal extent of the VOC plume in the shallow aquifer has been defined, and primarily is present under the former disposal area.

- The vertical extent of VOC contamination (i.e., primarily 1,2-DCE) in groundwater appears to be located in the upper portion of the Castle Hayne Aquifer. VOC levels in the upper portion of the Castle Hayne Aquifer appear to decrease rapidly as the plume migrates offsite to the east-southeast. Offsite VOC levels in the upper portion of the Castle Hayne Aquifer are below State and Federal groundwater standards.

- Groundwater quality in the intermediate zone of the Castle Hayne Aquifer has been slightly impacted by the VOCs. Low levels of 1,2-DCE were detected in monitoring wells 69-GW03DW and 69-GW15DW at concentrations below State and Federal drinking water standards. No off-site intermediate zone wells exhibited contamination.

- Target VOCs have not migrated to the deep zone of the Castle Hayne Aquifer.

- Although VOCs are present in both the shallow and Castle Hayne aquifers, the vertical and horizontal extent of contamination is limited in area. Based on existing data, the plume is estimated to cover an area of approximately three to four acres centering near well cluster 69-GWI5.

- The source of the VOCs may be associated with buried waste near well cluster 69-GW15. This area contains a significant amount of buried metallic debris, based on the results of the geophysical surveys. It is possible that the source of VOCs are within the fill area and may continue to impact groundwater quality. However, VOC levels in downgradient monitoring wells 69-GW02 and 69-GW03 appear to be decreasing.

- Elevated total metals in shallow groundwater are not believed to be indicative of past disposal operations. This conclusion is based on the following: metal concentrations in soil are similar to levels typically encountered throughout MCB, Camp Lejeune; there is no pattern or plume to suggest that the total metals are elevated due to a source; total metals in groundwater are similar to some of the background wells throughout the base; and, dissolved metals in groundwater are not elevated.

- Onsite ponded water in the southern portion of the site is contaminated with VOCs. The ponded water appears to be hydraulically connected to the shallow aquifer.

- Offsite surface water bodies have not been impacted by the site.

- Under current human health exposure scenarios, there are no adverse human health risks mainly because groundwater in this area is not utilized for potable supply, and because access to the site is restricted.

- Under future potential human health exposure scenarios involving residential use of the area, adverse human health risks would result due to groundwater exposure. Future residential use of the area is unlikely since the site is suspected of containing buried CWM.

- There are no significant ecological risks to aquatic or terrestrial receptors associated with Site 69. Although environmental media concentrations exceeded ARARs/TBCs, aquatic biosurveys indicate fish and benthic macroinvertebrate populations that are representative of typical estuarine and tidal freshwater systems are not adversely impacted by contaminant sources.

- Based on the human health and ecological risk assessments, groundwater is a media of concern at Site 69. Although there is no current groundwater exposure pathway that would result in adverse human health risks, VOCs are migrating into the Castle Hayne Aquifer. VOCs and inorganic contaminants were identified as contaminants of concern (COCs) for groundwater. The Castle Rayne Aquifer is utilized

  extensively throughout MCB, Camp Lejeune and the surrounding communities as a source of water.

- Based on the human health and ecological risk assessment, soil is not a media of concern at Site 69. However, there is a safety risk to humans under future land use scenarios due to the potential existence of buried CWM. Further, soil is a suspected source of VOC contamination for groundwater. The location of the source material remains unconfirmed due to the possible presence of buried CWM. Therefore, soil remains a media of concern at Site 69.

Post RI Treatability Study

In February 1996, a Treatability Study (TS) was initiated to evaluate an in-situ groundwater treatment technology at Site 69.

The DoN conducted this two phase treatability study to determine the technical and economic feasibility of using an innovative in-well aeration technology at Site 69. Two aeration well systems were installed: a UVB system in the upper Castle Hayne Aquifer; and a KGB system in the shallow aquifer. The objectives of the Phase I study (six months of actual operation) were to show that a groundwater circulation cell could be created at the site which would mobilize and transport contaminants to the UVB and KGB systems for treatment; experimentally (via dye test) determine the zone of influence (ZOI) of each circulation cell; and show that contaminants were being removed by monitoring for target VOCs in the off-gases, and in groundwater.

During six months of operation, the UVB well did not mobilize significant contaminants to the well for treatment. During the same time, the KGB well mobilized and removed at least 10.10 kg of target VOCs by stripping. On average, concentration of target VOCs were reduced by 15% in groundwater monitoring wells within the estimated ZOI of the KGB.

A round of groundwater samples were collected from selected monitoring wells at the end of the Phase I TS. The results show that groundwater in the upper zone of the Castle Hayne Aquifer remain high near the source area.

The following recommendations were made at the end of the Phase I TS:

(i) Relocate the UVB well to the area of high contamination in order to determine its treatment rate and efficiency as a remediation system.

(ii) Continue operation of the KGB system.

(iii) Conduct frequent (every two weeks) sampling and analysis of off-gases from both systems to determine the removal rates of target VOCs.

(iv) Sample groundwater from selected wells in the immediate vicinity of both systems.

The Phase II TS was initiated in June 1997. Plugging problem continued with the KGB system, and in October 1997, it was decided to shut down the KGB system. The UVB system was monitored until December 1997.

The following conclusions can be drawn from the data obtained and field observations made during the Phase II TS:

The KGB System

1. The KGB system failed to operate and perform consistently due to frequent plugging from the sand and sediments. This problem resulted from the formation material being substantially finer than the sand pack.

2. Every time after the well was redeveloped, the KGB system did operate adequately for a period of up to two weeks. Data collected during this period showed that volatile contaminants were being removed in the off-gas.

3. The ZOI of the KGB system could not be determined because it appears to be smaller than the monitoring wells positioned for such measurements.

4. The KGB system failed to meet the objectives of the treatability study.

The UVB-400 System

1. The UVB-400 system was successful in reducing the high concentrations observed in well 15UW after the Phase II TS. Concentrations of target VOCs in the well were reduced by 99%. A high ratio (85%) of recirculated water to fresh water entering the cell from the capture zone is causing excessive dilution of the contaminants, particularly near the UVB well.

2. In its present position, tile UVB system will effectively treat contamination in well 15IW. However, an asymptotic decrease in the concentration of contaminants will not be seen until at least a year of operation. Based on mathematical predictions, it will take a maximum of seven years of operation to reduce the concentrations of target compounds to less than 5 µg/L, in well 151W.

3. The slow treatment rate may be due to two factors: (a) Well 15IW is probably located immediately below the source area, and contaminants are being released from the source at a significant rate, and (b) mobilization of contaminants is being controlled by molecular diffusion from the sand/clay formation.

4. Pressure transducer test conducted at well cluster MW17 indicated that at a minimum, the circulation cell is influencing a radial distance of 56 ft. from the UVB.

5. Off-gas data indicted that the air stripping mechanism of the UVB system maintained a stripping efficiency of 98%. Approximately 8.3 lb of VOCs were removed during the Phase II study.

6. The spread of contamination in the upper Castle Hayne Aquifer is not uniform. Areas of high contamination appear scattered.

7. The groundwater recirculation rate attainable at the UVB-400 site (7.42 gpm) is less than that attainable at the UVB-250 site (20 gpm).

8. The chlorinated hydrocarbons in the area around monitoring well 15IW has been reduced by 16 percent. This is based on laboratory analysis of groundwater sample

showing 9,980 µg/L total vaolatiles on August 28, 1997 and of 8,400 µg/L on December 12, 1997.

9. All other monitoring areas (except 151W and 17UW) show little or not chlorinated hydrocarbon contamination.

2.3 Highlights of Community Participation

The PRAP for OU No. 14 (Site 69) was released to the public on June 28, 1998. This document is available in an administrative record file at information repositories maintained at Onslow County Public Library and the Installation Restoration Division Office (Room 238, MCB, Camp Lejeune). Also, all addresses on the OU No. 14 (Site 69) mailing list were sent a copy of the Final PRAP. The notice of availability of the PRAP was published in the "Jacksonville Daily News" on June 28, 1998. A public comment period was held from June 28, 1998 to July 28, 1998. In addition, a public meeting was held on June 30, 1998 in order to accept public comments on the PRAP for OU No. 14 (Site 69). The public meeting minutes were transcribed and a copy of the transcript is presented in Attachment B of this Interim ROD document. A copy of the transcript is also made available to the public at the aforementioned locations. A Responsiveness Summary, included as part of this Interim ROD, has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing this Interim ROD, MCB, Camp Lejeune and the DoN will publish a notice of availability for the Interim ROD in the local newspaper, and place this Interim ROD in the information repositories.

2.4 Scope and Role of Remedial Action

The results of the baseline human health and ecological risk assessments were evaluated to determine the areas of concern (AOC) within OU No. 14 that may warrant remediation or institutional controls to protect the public health and the environment.

Site 69 Areas of Concern

Shallow and deep groundwater and soil (including the landfill material) are media at Site 69 which could potentially pose unacceptable future human health, ecological, or human safety risks. As mentioned previously, these media do not present unacceptable risks to human health or the environment, at present.

Shallow and deep groundwater have been combined as one area of concern because of their hydraulic connection to one another (the aquifers are interconnected to each other and are contaminated by the same source). Shallow groundwater within the southeast portion of the former disposal area has exhibited elevated VOCs (mainly 1,2-DCE, TCE, and vinyl chloride) and to a limited degree, total metals (mainly iron and manganese). The total metals may be elevated as a result of sampling techniques/geologic conditions and not because of former disposal activities. Although there is no current human receptor associated with groundwater, future potential exposure to groundwater could occur under a residential land use scenario, or via migration of VOCs to potable supply wells in the Castle Hayne Aquifer. Although no base supply wells are in danger of being contaminated, new wells or off-base wells could potentially be contaminated over time.

The following objectives have been identified for groundwater:

- Prevent future potential exposure to contaminated groundwater;
- Protect uncontaminated groundwater for future potential beneficial use; and
- Restore contaminated groundwater for future potential beneficial use.

Soil, including the landfill material, has been identified as the second AOC at Site 69. The soil/landfill material does not currently result in unacceptable human health risks, but may result in unacceptable safety risks under all future potential land use scenarios due to the potential existence of buried CWM. Also, although the detected soil contaminant concentrations do not directly contribute to a current or future human health risk, soil is the presumed source of VOC groundwater contamination.

The following remedial action objectives have been identified for soil at Site 69:

- Prevent future potential exposure to contaminated subsurface soil (including landfill materials); and
- Prevent potential migration of contaminants to shallow groundwater.

2.5 Summary of Site Characteristics

Site 69 is underlain by silty sands from the ground surface to a depth of approximately 18 feet. Beneath the silty sand is a fairly continuous sandy clay, and sand and clay unit, to a depth of approximately 27 feet. This unit could potentially act as a retarding layer. The upper unit of the Castle Hayne Aquifer, which was encountered below the sand and clay retarding layer, consists of silty sand with shell and limestone fragments.

The upper portion of the formation is comprised of silty sand with shelf and limestone fragments with an average thickness of approximately 40 feet. Below the silty sand is a sand unit with trace to little sift. This unit also exhibits a sandy clay/clayey sand layer, with an approximate thickness of 109 feet, at a depth of 145 feet, The deep borings to the bottom of tile Castle Hayne Aquifer encountered limestone beds in the lower portion, beneath the sand unit. These limestone beds are identified in tile literature as “marker beds” for the bottom of the Castle Hayne Aquifer, and were encountered in the three deep borings performed in March/April 1996 at depths of approximately 207 feet.

Beneath the limestone beds is silty sand with a 4 foot thick silty, sandy clay layer/lenses. At a depth of 245 feet, a silty sand unit was encountered which appeared to be glauconitic. Glauconitic is a descriptive term which refers to a greenish platy material which occurs in sediments of marine origin. A glauconitic sand unit is identified as part of the Beaufort formation, which lies below the Castle Hayne Aquifer and the Beaufort confining unit.

The shallow groundwater is typically encountered within a few feet of ground surface to a depth of approximately 5 feet. Groundwater flow is radial from the site to the low lying areas to the north, south, east, and west. Groundwater flow in the upper portion of the Castle Hayne Aquifer is towards the south/southeast in the southern portion of the site. There would appear to be some interconnection between the shallow water table aquifer and the Castle Hayne Aquifer due to the similar groundwater elevations at some of the monitoring well locations. Groundwater flow in

the deep portion of the Castle Hayne Aquifer is eastward towards the New River. Recharge for the Castle Hayne Aquifer would be from the west, and possibly from the surficial aquifer as the units are separated by a serniconfining layer. The gradient for the deep Castle Hayne Aquifer was calculated to be 0.002 ft/ft, which is flat.

2.6 Summary of Site Risks

Human Health Risk Assessment

The baseline human health risk assessment was based on possible exposure pathways under current and future potential exposure scenarios. Under current conditions, the exposed population considered base personnel who may be exposed to site contaminants during military training operations (Site 69 is in a remote area of the base where military training occurs). The exposure medium is primarily associated with surface soil. Groundwater was not considered as an exposure medium since the base is serviced by a public (base) water supply system. In addition, there are no supply wells which have been impacted by Site 69. Future potential exposure scenarios involved construction personnel and residential use. For the residential scenario, groundwater and surface soil were identified as exposure media. It should be noted that the future residential exposure pathway to soil or groundwater is extremely unlikely given that the site is suspected of containing buried CWM. For the future construction pathway, subsurface soil was identified as the exposure medium.

Given the absence of chemicals of potential concern (COPCs) in the surface soil, current land use (fenced area with restricted access), and that groundwater in this area is not used for potable purposes, there are no current risks posed to any population from this site. Under the future potential risk exposure scenario, the total site incremental carcinogenic risk (ICR) estimated for children (4E-04) and adults (6E-04) exceeded the USEPA's upper bound risk range (1E-04). The total site ICR estimated for construction workers (6E-08) was less than the USEPA's lower bound target risk range (1E-06). Additionally, the total site hazard index (HI) for children (28) and adults (11) exceed unity. The total site HI estimated for the construction worker (0.02) did not exceed unity. The total site risk under the future potential exposure scenarios was driven by exposure to shallow groundwater. It should be noted that the estimated ICRs and HIs for exposure to subsurface soil do not account for the possibility of exposure to CWM since CWM-related contaminants could not be quantified during the RI.

Site-specific soil screening levels (SSLs) that estimate a contaminant concentration at which that contaminant is likely to migrate from soil to groundwater were calculated and are presented in Attachment C. These SSLs were calculated based on equations for organics and inorganics obtained from USEPA's Soil Screening Guidance: Technical Background Document (USEPA, 1996). Site-specific/chemical-specific parameters were input into the equations when available. The target soil leachate concentrations (Cw) for each compound and analyte used in the SSL calculations were the groundwater COC remediation levels (RLs) determined in the Feasibility Study (FS).

Ecological Risk Assessment

Overall, metals and pesticides appear to be the most significant site related COPCs that have the potential to affect the integrity of the aquatic ecosystems at OU No. 14. For the terrestrial ecosystems, metals appear to be the most significant site related COPCs that have the potential to affect terrestrial receptors at OU No. 14.

Potential adverse impacts to threatened or endangered species are low due to the absence of critical habitats or noted observations at the site. Biohabitats maps did not indicate a significant impact to ecological resources on or near Site 69.

Copper and silver exceeded the ARARs or guidelines "to be considered" (TBCs) in surface water. The silver quotient ratio was slightly high. Although silver was above the base-wide and median concentrations, it is not related to the site. This conclusion is based on fish tissue samples collected from Everett Creek and the New River which showed similar contaminant concentrations compared to published background levels and the detection of low surface water silver concentrations within Everett Creek. Silver was not detected in sediment samples collected from Everett Creek or the New River. However, silver was detected in upstream New River surface water samples at concentrations similar to those found in Everett Creek. Additionally cadmium, mercury, benzo(a)pyrene, 4,4'-DDE, 4,4'-DDT, and PCB-1260 exceeded National Oceanic and Atmospheric Administration (NOAA) sediment screening criteria. The sediment exceedances indicated concentrations above the base-wide and median concentration for cadmium, mercury, 4,4'-DDE, 4,4'-DDT, and PCB-1260.

The potential risks to aquatic receptors due to the above exceedances in the surface waters around the site was evaluated by conducting biosurveys and fish tissue analysis. Fish populations were sampled and were representative of estuarine and tidal freshwater systems. The predominant fish species were croaker, Easter mosquito, and pinfish. There were no anomalies observed on tile fish. The fish community appeared healthy, suggesting it was not impacted by site-related or other contaminants.

Fish tissues were sampled and the following were detected: organics (benzene, toluene, and 2-methyl phenol), pesticides (4,4'-DDE and 4,4'-DDD), PCBs (1254 and 1260), and metals (aluminum, beryllium, cadmium, iron, selenium, silver, and zinc). The levels detected in fish tissue were low when compared to published background values, indicating that the fish were not impacted by excess levels of these COPCs due to the site.

Benthic invertebrates were sampled and were representative of estuarine and tidal freshwater species. The predominant species included capitellids followed by tubificids, spionids, goniadids, and bivalves. Diversity and density were characteristic of salinity ranges of zero to 15 parts per thousand (ppt) in regional surface waters.

No COPCs exceeded soil toxicity reference levels and based on the comparison of chronic daily intakes and terrestrial reference values, there does not appear to be an impact to terrestrial organisms including rabbits, deer, quail, fox, and raccoon from the site.

2.7 Summary of Remedial Action Alternatives

A selected rern,edy should be protective of human health and the environment; be cost effective; comply with applicable statutory laws, and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent possible. The remedy also should comply with the same statue that prefers the use of treatment as a principle element for the reduction of toxicity, mobility, or volume of hazardous substance.

Five alternatives were developed to meet the remedial objectives for groundwater and two alternatives were developed to meet the remedial objectives for soil. A short description of these alternatives and a summary of their associated costs are presented below.

2.7.1 Site 69 Groundwater (GW) Alternatives

The groundwater remedial alternatives developed for Site 69 are listed below:

- Alternative 69GW-1 - No Action
- Alternative 69GW-2 - Institutional; Controls and Monitored Natural Attenuation
- Alternative 69GW-3 - Groundwater Extraction and Physical Treatment with Institutional Controls and Monitoring
- Alternative 69GW-4 - Dual-Phase Vacuum Extraction and Groundwater Extraction and Physical Treatment, Institutional Controls, and Monitoring
- Alternative 69GW-5 - In-Situ Air Striping with Institutional Controls and Monitoring

Alternative 69GW-1 - No Action

Description: Under this alternative, no actions would be taken to contain or treat contaminated groundwater at Site 69. Natural attenuation of contaminants will most likely occur. However, this alternative provides no controls to ensure that it is occurring, nor does this alternative prevent accidental exposure should the plume migrate unnoticed to an exposure point.

Shallow groundwater generally flows radially from the center of the site, whereas deeper groundwater in the Castle Hayne Aquifer flows in a general easterly direction towards the New River. Groundwater on site currently is not used for any purpose. Potable water throughout the base is supplied by wells located in the mid and lower regions of the Castle Hayne Aquifer. The shallow aquifer is not used as a potable water supply on base. However, both the shallow and upper Castle Hayne aquifers are classified as GA waters under the North Carolina Water Quality Standards (NCWQS), which are current or potential sources of drinking water. There are no groundwater production wells located downgradient of the site.

Cost: There are no costs associated with this alternative.

Alternative 69GW-2 -Institutional Controls and Monitored Natural Attenuation

Description: Under this alternative, a groundwater monitoring program, along with land use and aquifer use controls, will be implemented as institutional controls. In addition, remedial actions associated with the in-situ, naturally occurring biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization/destruction of the VOCs in groundwater are expected in the form of natural attenuation. Existing monitoring wells will be included under this monitoring program. Samples collected from these wells will be analyzed for parameters indicative of natural attenuation as well as for CWM degradation products.

The aquifer use controls will prohibit future use of the shallow and Castle Hayne aquifers, within a 1,000 foot radius of Site 69. It should be noted that North Carolina regulations prohibit the installation of water supply wells that draw from the plume even if they are outside the 1,000 foot buffer zone. Details of the Site 69 aquifer use controls are presented in Attachment D, the LUCIP for Site 69.

To initialize the data collection process, groundwater monitoring at Site 69 is currently conducted on an interim semi-annual basis. Details of the monitoring program (number and location of samples collected and analyses performed) are presented in the current Long-Term Monitoring Work Plans for Camp Lejeune. A post-Interim ROD Monitoring Work Plan will be issued that will include quarterly groundwater sampling and analysis of selected shallow, intermediate, and deep wells. The details of the monitoring program will be prepared subsequent to Interim ROD signing. The samples will be analyzed for Target Compound List (TCL) VOCs to monitor contaminant concentrations in the shallow and Castle Hayne aquifers over time. Select groundwater samples will be analyzed for CWM degradation products to detect possible corrosion or rupturing of drums; while select groundwater samples will also be analyzed for inorganics to determine if the inorganic COCs are migrating. For cost estimating purposes, the FS assumed quarterly sampling of 24 wells for years 1-5, and semiannual sampling of 12 wells for years 6-30. The lead agency will be required to review the effects of this alternative at least once every five years until it can be demonstrated that continued attainment of remedial goals has been achieved. In addition, should the groundwater quality improve, the sampling frequency may be reduced.

In an effort to provide additional evidence that natural attenuation is occurring, this alternative incorporates the option of performing an annual contaminant fate and transport model.

Cost: The estimated costs of this alternative are as follows:

- Capital: $0
- Annual operation and maintenance: $63,000 (years 1-5); $24,000 (years 6-30)
- Net present worth (30-year): $535,000

Alternative 69GW-3 - Groundwater Extraction and Physical Treatment, Institutional Controls, and Monitoring

Description: Under this alternative, a groundwater extraction, treatment, and discharge system would be constructed and operated on site for the shallow and upper Castle Hayne aquifers.

The groundwater extraction system would be used to extract and contain groundwater contaminated above the cleanup goals developed for the shallow and upper Castle Hayne aquifers (i.e., NCWQS). If possible, the system would be operated until groundwater cleanup goals are achieved. However, these levels may be impossible to achieve since it has been demonstrated that groundwater contaminant levels typically reach asymptotic levels, which may exceed NCWQS. Performance curves would be periodically (e.g., annually) developed to monitor the effectiveness of the groundwater remediation system. If the performance curves indicate that asymptotic levels have been reached, which exceed NCWQS for some contaminants, then the cleanup goals would be re-evaluated at that time. In addition, although contaminants detected in the groundwater exceeded State and Federal staridards, the presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards.

Groundwater would be pumped using a series of downgradient well pairs located near the downgradient edge of the contaminant plume and a well pair located near the plume center. Each well pair would consist of a shallow well (approximately 25 feet deep) and an upper Castle Hayne well (approximately 60 feet deep). All pumping wells would be connected to a common header pipe that discharges to a common treatment system.

The groundwater treatment system included under this alternative has been sized to accommodate a total flow rate of 100 gallons per minute (gpm).

Based on available data, it appears that a pretreatment system may be needed for the removal of suspended solids and nuisance metals from groundwater, such as iron and manganese, to prevent fouling (clogging) of the air stripper. If necessary, an acid (e.g., sulfuric acid) or sequesterant (e.g., polyphosphate chemicals) addition system could be included which would help keep dissolved iron and manganese in solution, with only a modest increase in capital and operating cost. With this type of system, a low-profile air stripper would be desirable because, if necessary, it could be disassembled and cleaned periodically much easier than could a packed tower.

If a more aggressive pretreatment system is needed for the removal of suspended solids and nuisance metals from groundwater, capital and operating costs would increase by more than twofold. In this case the pretreatment could consist of equalization, flocculation/precipitation, clarification, filtration, and sludge dewatering.

The treated groundwater would be discharged to the New River, which is located approximately 1,200 feet from the site.

Under this alternative, a groundwater sampling program would be initiated for the site. The groundwater sampling program would incorporate the periodic sampling of existing groundwater monitoring wells. Initially, groundwater sampling would be conducted on a semi-annual basis (i.e., two times per year) until a stable or decreasing trend in contaminant levels is observed.

In addition to the environmental monitoring program, institutional controls would be implemented under this alternative to control groundwater usage in the vicinity of the site. The site would be given. a groundwater use category in the base master planning process that would prohibit installation of potable water supply wells in the vicinity of the site (e.g., within a 1,000-foot radius).

Cost: The estimated costs of this alternative are as follows:

- Capital: $1,047,000
- Annual operation and maintenance: $67,000
- Net present worth (30-year): $2,088,000

Details of the cost estimate are presented in the FS report.

Alternative 69GW-4 - Dual Phase Vapor Extraction with Groundwater Extraction and Physical Treatment, Institutional Controls, and Monitoring

Description: A groundwater extraction, treatment, and discharge system would be constructed for the upper Castle Hayne Aquifer and operated on site.

Groundwater would be pumped using a series of downgradient wells located near the downgradient edge of the contaminant plume and a well located near the plume center. The downgradient set of extraction wells was developed based on the pumping rate necessary to contain the plume, the number of wells needed to achieve the pumping rate, and the optimum spacing between the wells to capture the groundwater. In addition to capturing groundwater near the downgradient edge of the plume, the groundwater collection system also was designed to pump water from the immediate source area to prevent the spread of the highly contaminated groundwater. The total flow rate for the conceptual pumping well extraction system is 76 gpm.

In addition, under this alternative, an area approximately 100 feet by 300 feet (30,000 square feet) of contaminated soil and shallow groundwater would be remediated using a dual-phase vacuum extraction (DPVE) system, which removes contaminated soil gas and shallow groundwater for subsequent treatment.

DPVE is a method to remediate soil and groundwater using only a single extraction system. This method is well-suited for shallow aquifers with low hydraulic conductivities and for sites with high water tables (shallow vadose zones), such as Site 69.

The DPVE and treatment system would consist of several major components. The extraction system would include the extraction wells (each 20 feet deep) and underground interconnecting well piping. Three extraction wells and a radius of influence of 50-feet were assumed for costing purposes. Radii of influence can range from about 20 feet to more than 100 feet. In addition, it was assumed that the DPVE system would produce 9 gpm from each extraction well, compared to 3 gpm using a conventional submersible pump. A DPVE pilot test would be required to determine the actual radius of influence (i.e., optimum well spacings) and groundwater yield for Site 69.

The DPVE treatment system would include the following major components:

- Air/water separator system
- Liquid ring vacuum pump system with associated air/water separator and heat exchanger
- A vapor-phase carbon adsorption system with associated pre-treatment heat exchanger

The groundwater treatment system included under this alternative has been sized to accommodate a total flow rate of 125 gpm. However, during a remedial design phase, additional capacity for potential future increases in groundwater flow rates could be designed into the system.

Based on available data, it appears that a pretreatment system may be needed for the removal of suspended solids and nuisance metals from groundwater, such as iron and manganese, to prevent fouling (clogging) of the air stripper. An acid (e.g., sulfuric acid) or sequesterant (e.g., polyphosphate chemicals) addition system would be included in the system with only a modest increase in capital and operating cost, which would help keep dissolved iron and manganese in solution. With this type of system, a low-profile air stripper would be desirable because, if necessary, it could be disassembled and cleaned periodically much easier than could a packed tower.

If a more aggressive pretreatment system is needed for the removal of suspended solids and nuisance metals from groundwater, capital and operating costs would increase by more than twofold. In this case, the, pretreatment could consist, of equalization, flocculation/precipitation, clarification, filtration, and sludge dewatering.

As with Alternative 69GW-3, a groundwater sampling program and institutional controls would be initiated for the site.

Cost: The estimated costs of this alternative are as follows:

- Capital: $1,238,000
- Annual operation and maintenance: $98,200
- Net present worth (15-year): $2,337,000
- Net present worth (30-year): $2,748,000

The estimated cost does not include the cost of performing an on-site pilot test, which would most likely range from approximately $100,000 to $200,000. Details of the cost estimate are presented in the FS report.

Alternative 69GW-5 - In-Situ Air Stripping with Institutional Controls and Monitoring

Description: In-situ air stripping is an innovative technology that was developed and patented by IEG Technologies Corporation in 1992. IEG' s in-situ stripping technology is called UVB (German: Unterdruck Verdampfer Brunnen), which in English is translated as vacuum vaporizer well. A treatability study for two in-situ aeration systems (UVB and KGB) was conducted to determine the technical and economic feasibility of each system. The KGB system study was discontinued because it was technically infeasible for the sandy formation at Site 69. The system was frequently plugged by sand and sediments making operation impractical. Therefore, even though the UVB system showed some removal of VOCs from groundwater, it is still considered to be a possible remediation technology option.

The UVB in-situ air stripping process consists of a specialty adapted vacuum vaporizer well that contains a vacuum reactor, an aboveground blower, and an off-gas treatment system. The offgas treatment system typically consists of activated carbon units.

The vacuum vaporizer well has two separate screen segments, one at the well bottom where groundwater enters the well and one above the vacuum reactor. The groundwater entering the well through the lowered screened segment is drawn upward through the well, is stripped of volatile contaminants, and returns to the aquifer through the upper screened segment. This pumping action generates a three dimensional circulation flow of groundwater within the area surrounding the well. In some wells, an additional pump is installed to enhance the pumping effect of the air bubbles. The contaminated air is transported upward within the well by the induced vacuum and is then drawn to the off-gas treatment system.

The conceptual pumping well arrangement includes three UVB systems to remediate groundwater in the upper Castle Hayne Aquifer. The three wells would be positioned near the plume center.

As with Alternatives 69GW-3 and 69GW-4, a groundwater sampling program and institutional controls would be initiated for the site.

Cost: The estimated costs of this alternative are as follows:

- Capital: $246,000
- Annual operation and maintenance: $39,000
- Net present worth (30-year): $853,000

Details of the cost estimate are presented in the FS report.

Site 69 Soil (SO) Alternatives

The soil remedial alternatives developed for Site 69 are listed below:

- Alternative 69SO-1 - No Action
- Alternative 69SO-2 - Institutional Controls

No containment alternatives were proposed due to the undesireable implementability of a cap at the site. A capping alternative was eliminated during the screening process because of the risk of uncovering CWM during clearing and regrading activities required for installation of a cap.

Alternative 69SO-1 - No Action

Description: The No Action Alternative is required by the NCP to provide a baseline comparison for other remediation alternatives. Under the No Action Alternative, no remedial action would be performed to reduce the toxicity, mobility, or volume of soil contamination or waste at Site 69.

Cost: There are no costs associated with this alternative.

Alternative 69SO-2 - Institutional Controls

Description: Under this alternative, institutional controls would be implemented to limit access and control future use of the site. These institutional controls would consist of maintenance of an existing fence and signs which designate the area as a restricted area.

Under this alternative, the existing 6-foot high chain-link fencing encompassing the site and warning signs would be maintained to restrict site access. The signs indicate that wastes are buried at the site and that access within the fenced area is prohibited.

Under this alternative, the site would be given a land use category in the base master planning process that would prohibit all land uses except for investigative, remediation or monitoring purposes. Details of these controls are included in the LUCIP presented in Attachment D. Because contaminants will be left in place, the lead agency will be required to review the effects of the alternative at least once every five years.

Cost: The estimated costs of this alternative are as follows:

- Capital: $0
- Annual operation and maintenance: $900
- Net present worth (30-year): $13,800

Details of the cost estimate are presented in the FS report.

2.8 Evaluation of Alternatives/Comparative Analysis

This section summarizes the detailed analysis of alternatives that was conducted for the Site 69 soil and groundwater remedial alternatives, including the following seven USEPA evaluation criteria: overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Table 1 provides definitions of each evaluation criterion.

Overall Protection of Human Health and the Environment

With respect to groundwater, Alternative 69GW-1 (No Action) would not contain or remediate groundwater, nor would this alternative prevent future potential exposure to groundwater. Natural attenuation processes will most likely occur, but will be unconfirmed. The remaining four groundwater alternatives all involve groundwater remediation in different forms, and groundwater monitoring and institutional controls to prevent exposure to groundwater. Monitoring will provide a warning system against contaminants that have migrated to unsafe locations and contaminant concentrations that have increased to unsafe levels, so that human exposure can be avoided. Alternative 69GW-4 would involve the most aggressive form of remediation since some reduction in soil contamination would also be expected to occur. (Although the elevated soil contaminant concentrations do not pose current or future potential human health or ecological risks, contaminated soil has the potential to act as a source of groundwater contamination.) None of the alternatives are believed to represent a permanent solution to restoring groundwater for future consumption or use since the source of the groundwater contamination can not be removed due to the reported presence of CWM under the site.

With respect to soil, Alternative 69SO-1 would not be protective of human safety (due to reported buried CWM) if the site is used for other purposes in the future. However, under Alternative 69SO-2, site controls can be imposed to prevent the use of the area and prevent exposure to CWM.

Compliance with ARARs

With respect to groundwater, onsite groundwater quality exceeds State and Federal standards for drinking water or the protection of groundwater. Offsite groundwater quality has been shown to be below drinking water standards in both the shallow aquifer and the Castle Hayne Aquifer. With long-term groundwater treatment, either through monitored natural attenuation (Alternative 69GW-2) or active processes (Alternatives 69GW-3 through 69GW-5), groundwater contaminant levels on site may achieve these standards over time. However, the presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards. A waiver of Federal ARARs is possible on the grounds that it is technically impracticable to permanently restore the aquifers from an engineering perspective. However, any determination of this type is reserved for future application in the Final ROD only if appropriate.

With respect to soil, there are no chemical-, location-, or action-specific ARARs since no active remediation would be undertaken with either alternative.

Long-Term Effectiveness and Permanence

Regarding groundwater, Alternatives 696W-2 through 69GW-5 would all be effective in preventing exposure to groundwater through the use of institutional controls such as land use controls, aquifer use controls, and groundwater monitoring. Under Alternative 69GW-1 (No Action), there would be no controls to prohibit future use of the aquifer and possible exposure to site contaminants. Alternatives 69GW-2 through 69GW-4 would only be effective as long as the plume could be contained while the applicable systems were operating. The effectiveness of the UVB system (Alternative 69GW-5) could be limited as indicated by the results of the treatability study.

Regarding soil, Alternative 69SO-2 would provide a long-term permanent solution by implementing institutional controls to restrict future use of the land in order to prevent exposure to site contaminants.

Reduction of Toxicity, Mobility, or Volume Through Treatment

With respect to groundwater, no reduction of toxicity, mobility, or volume would be provided by Alternative 69GW-1. Alternative 69GW-2 would provide some reduction due to remediation via natural attenuation. Alternatives 69GW-3 through 69GW-5 would provide the most aggressive reduction in toxicity, mobility, or volume since these alternatives involve operating systems.

With respect to soil, neither Alternative 69SO-1 or 69SO-2 would meet this criterion since neither alternative involves remediation of the soil contaminants. Alternative 69GW-4 would provide some reduction in toxicity, mobility, or volume of soil contamination via the DPVE treatment system.

Short-Term Effectiveness

With respect to groundwater, the No Action alternative would be the only alternative where no short-term risks would be expected since no activities would be implemented. Under the remaining alternatives, there would be potential risks to workers during the installation of the treatment systems, or during groundwater monitoring. Tasks involving intrusive activities such

as installing extraction wells or treatment units would require the assistance of the U.S. Army Technical Escort Unit for purposes of monitoring the site for the presence of chemical warfare agents and their degradation products. No impacts to base personnel are expected with any of the alternatives due to the remote location of the site.

With respect to soil, neither alternative would involve any remedial actions that would pose a risk to human health or the environment during implementation.

Implementability

With respect to groundwater, Alternatives 69GW-1 and 69GW-2 can be easily implemented. Alternatives 69GW-3 through 69GW-5 would require coordination with the U.S. Army during intrusive activities. The drilling and construction activities associated with Alternatives 69GW-3 through 69GW-5 would all involve similar levels of difficulty. In addition, the remote location of the site and the ability to check and monitor the systems would result in greater implementability concerns for Alternatives 69GW-3 through 69GW-5 than with Alternative 69GW2.

With respect to soil, there would be no implementability concerns with either alternative.

Cost

The net present worth costs of the five groundwater alternatives are provided below in order from least expensive to most expensive, each considering 30 years of operation (excluding 69GW-1):

- Alternative 69GW-1 $0
- Alternative 69GW-2 $535,000
- Alternative 69GW-5 $853,000
- Alternative 69GW-3 $2,088,000
- Alternative 69GW-4 $2,748,000

The net present worth costs for the soil alternatives are provided below in order from least expensive to most expensive, considering 30 years of operation for 69SO-2:

- Alternative 69SO-1 $0
- Alternative 69SO-2 $13,800

3.0 SELECTED REMEDY

The proposed alternatives best suited to meet the remedial action objectives for groundwater and soil, based on the overall evaluation of the NCP criteria, are:

- Alternative 69GW-2 (Institutional Controls and Monitored Natural Attenuation)

- Alternative 69SO-2 (Institutional Controls)

Based on available information and the current understanding of the conditions at Site 69, the selected remedy appears to provide the best balance with respect to the USEPA evaluation criteria previously described. The selected remedial actions identified for Site 69 are expected to meet the following site-specific objectives that were developed for groundwater in the FS document:

- Prevent future potential exposure to contaminated groundwater.

- Protect uncontaminated groundwater for future potential beneficial use.

Soil, including the landfill material, has been identified as the second AOC at Site 69. The soil/landfill material does not currently result in unacceptable human health risks, but may result in unacceptable risks under a future potential scenario involving residential land use or construction. The fact that the site is suspected to contain CWM results in a risk from a safety as well as a health standpoint.

The selected remedial actions identified for Site 69 are expected to meet the following site-specific objective developed for soil:

- Prevent future potential exposure to contaminated subsurface soil (including landfill materials).

3.1 Summary of Selected Remedy for OU No. 14

The selected remedy for OU No. 14 consists of groundwater alternative 69GW-2, Institutional Controls and Monitored Natural Attenuation and soil alternative 69SO-2, Institutional Controls. A summary of each remedy component is provided below.

3.1.1 Groundwater - Institutional Controls and Monitored Natural Attenuation

A groundwater monitoring program, along with aquifer use controls, will be implemented as institutional controls. In addition, remedial actions associated with the in-situ, naturally occurring biodegradation, dispersion, dilution, adsorption, volatilization, and chemical or biological stabilization/destruction of the VOCs in groundwater are expected in the form of natural attenuation. “Natural attenuation” refers to the processes that occur naturally in soil and groundwater environments without human intervention that reduce the mass, toxicity, mobility, volume, or concentration of organic contaminants in these media.

The purpose of the groundwater monitoring program is to track the groundwater VOC contaminant plume’s migration over time, to evaluate any fluctuations in contaminant levels in the groundwater, and to identify the amount of contaminant reduction that has occurred over time. Select groundwater samples will also be analyzed for CWM degradation products to determine if buried CWM has been released. Select groundwater samples will also be analyzed for inorganics to determine if the contaminants are migrating. For cost estimating purposes, the FS assumed 5 years of quarterly sampling of 24 wells, followed by 25 years of semiannual sampling of 12 wells. In turn, the cost estimate for this alternative also incorporates the reduction of analytical and labor costs starting in the sixth year of the program. The lead agency will be required to review the effects of this alternative at least once every five years until it can be demonstrated that continued attainment of remedial goals has been achieved. In addition, should the groundwater quality improve, the sampling frequency may be reduced. Details of assumptions made for the cost estimate are found in the FS report.

The monitoring wells preliminarily selected during the FS for this alternative are identified on Figure 3. A total of 24 wells have been preliminarily identified for inclusion in the monitoring program. As shown on Figure 3, the wells will monitor: the shallow aquifer; and, the upper zone, intermediate zone, and deep zone of the Castle Hayne Aquifer. Monitoring wells also are positioned to evaluate the source area (near well clusters GW15 and GW17), upgradient areas, and downgradient areas (including offsite). All samples collected from the monitoring wells will be analyzed for VOCs. The location and number of samples collected may change according to analytical results. The actual wells initially selected for sampling following approval of this Interim ROD will be presented in Long-Term Monitoring Work Plans for Site 69. Samples have already been collected from 14 wells on a semiannual basis. The details of the current sampling program can be found in the existing Long-Term Monitoring Work Plan for Camp Lejeune.

For purposes of evaluating the effectiveness of natural attenuation, groundwater samples also will include laboratory analyses of nitrate, sulfate, methane, ethane, ethene, and chloride. Field analyses will be conducted on groundwater samples to determine the levels of oxygen, iron II, alkalinity, oxidation-reduction potential (ORP), pH, temperature, conductivity, and major cations. Over time, the results will be used to predict the kind and amount of contaminant reduction that has occurred, as well as, the amount of contaminant reduction that is expected.

Additional monitoring wells may be added to the program, if necessary. Likewise, if the analytical results indicate that the groundwater quality has improved, the monitoring program may be refined to include fewer sampling locations or less frequent sampling events.

Biodegradation may occur as an aerobic, anaerobic, or cometabolic process. Aerobic processes involve oxidation-reduction reactions in which oxygen is the electron receptor. Anaerobic processes involve iron-reducing, denitrifying, and sulfate-reducing reactions. Cometabolic processes involve carbon dioxide-reducing reactions and result in the accumulation of methane as a final product. Technical literature indicates that chlorinated solvent contamination can undergo natural attenuation through one or a combination of these biodegradation processes. At Site 69, the following evidence suggests that natural attenuation processes are successfully degrading the chlorinated solvent contamination in the shallow and upper portion of the Castle Hayne aquifers:

- Tetrachloroethene (PCE), TCE, DCE, and vinyl chloride have all been detected within the estimated boundary of contaminated groundwater at Site 69 which indicates that natural degradation is taking place (degrading from PCE to TCE to DCE to vinyl chloride).

- The locations and concentrations of the chlorinated compounds within each well are positioned as to suggest that the daughter products detected are the direct result of the VOC degradation. Laboratory analyses of the breakdown products show that contaminant levels decrease as the plume extends from the source area.

Based upon this information, the natural attenuation alternative appears to be a justiciable remedial option for the chlorinated solvent contamination detected in the surficial and upper portion of the Castle Hayne aquifers. In an effort to provide additional evidence that natural attenuation is occurring, remedial alternative 2 incorporates the option of performing a contaminant fate and transport model. The cost estimate accounts for annual modeling as new results become available.

Aquifer use controls will be implemented to prohibit future use of the shallow and Castle Hayne aquifers within a 1,000 foot radius of Site 69. The installation of water supply wells that draw from the plume are prohibited by North Carolina regulations even if they are outside the 1,000 foot buffer zone. Controls will remain in place until it is demonstrated that continued attainment of remedial goals has been achieved. A "Notice" for Site 69 will be filed at the Onslow County Courthouse. Cancellation of the "Notice" may not occur until it is demonstrated that continued attainment of remedial goals has been achieved. In addition, the base master planning process will provide controls on the use of the site. Additional details of the land use controls are provided in the LUCIP presented in Attachment D.

Until RLs are met, the NCP [40 Code of Federal Regulations (CFR) 300.430(f)(4)] requires the lead agency to review the effects of this alternative no less often than once every five years.

3.1.2 Alternative 69SO-2 - Institutional Controls

Under this alternative, institutional controls would be implemented to limit access and control future use of the site. These institutional controls would consist of maintenance of the existing fence and signs that designate the area as a limited-use area. No remedial action would be performed to reduce the toxicity, mobility, or volume of soil contamination or waste at the site.

Under this alternative, the existing 6-foot high chain-link fencing encompassing the site and warning signs would be maintained to control site access. The signs indicate that wastes are buried at the site and that all land use, other than those for investigative, remediation, or monitoring purposes, is prohibited.

The site currently is not used for residential purposes, and there are no plans to convert the area to residential use. However, there currently is no official land use category for the site within the base master planning process. Under this alternative, the site would be given a land use category within the base master planning process that would prohibit all use of the area except for investigative, remediation, or monitoring purposes. Land use controls are described in more detail in the LUCIP presented in Attachment D.

3.2 Remediation Levels

Table 2 presents the RLs developed for groundwater. These levels are based on State groundwater standards, Federal Maximum Contaminant Levels (MCLs), or risk-based concentrations (RBCs) calculated specifically for Site 69. No RL was developed for CWM in groundwater or soil, but groundwater will be monitored for CWM degradation products to detect any accidental release from buried drums. Groundwater will also be monitored for inorganics to determine if the inorganic COCs are migrating. No RLs were developed for soil because no human health or ecological COCs were identified for soil. Land use controls will remain in effect until the CWM is removed or other site conditions warrant additional actions at Site 69 that would supercede the actions presented in this Interim ROD.

4.0 STATUTORY DETERMINATIONS

A selected remedy must satisfy requirements of CERCLA, Section 121, including: protection of human health and the environment; compliance with ARARs; cost effectiveness; utilization of permanent solutions and alternative treatment technologies or resources recovery technologies to the maximum extent practicable; and preference for treatment that reduces toxicity, mobility, or volume as a principle element (or provide an explanation as to why this preference is not satisfied).

As described in Section 3.0 of this Interim ROD, OU No. 14, Site 69 requires remedial action. The evaluation of how the selected remedy for Site 69 satisfy the CERCLA requirements is presented below.

4.1 Protection of Human Health and the Environment

Monitoring and institutional controls would provide protection of human health by preventing exposure to potential contaminated groundwater by controlling the future use of the groundwater (except for monitoring purposes) at Site 69. Although contaminants in the groundwater do not appear to be creating unacceptable ecological risks, the institutional controls identified for Site 69, along with the passive treatment of VOC contaminants via natural attenuation, are expected to provide protection to the environment. Groundwater monitoring for inorganics will protect human health by tracking migration and warning of possible exposure. Human safety will also be protected through land use controls that will prevent possible exposure to CWM reportedly buried at the site.

Based on the non-residential use and the lack of development, human health risks associated with contaminated groundwater at Site 69 are considered minimal. Treatment via natural attenuation of VOCs would provide protection of human health, while any adverse impacts to ecological receptors are expected to be low.

Institutional controls and monitored natural attenuation will protect human health by preventing future human exposure to potential contaminants in the groundwater. Aquifer use controls will prevent future human exposure by prohibiting the use of the shallow and Castle Hayne aquifers within a 1000-foot radius of Site 69. The groundwater monitoring program will prevent future human exposure by providing a warning system should contaminant concentrations increase to unsafe levels. Controls on land use will also be enforced to prevent exposure to safety risks posed by buried CWM.

4.2 Compliance with Applicable or Relevant and Appropriate Requirements

There are no location-specific ARARs associated with the selected remedy for Site 69. However, the remedial actions at the site must comply with the action-specific ARAR identified for use with the monitored natural attenuation alternative [North Carolina Administrative Code (NCAC) 2L.0106(l)].

With respect to groundwater, onsite groundwater, quality does not meet State and Federal standards for drinking water or the protection of groundwater. Off site groundwater quality has been shown to achieve drinking water standards in both the shallow and the Castle Hayne aquifers. With groundwater treatment through natural attenuation (Alternative 69GW-2) groundwater contaminant levels on site may achieve these standards over time. However, the

presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards. A waiver of Federal ARAR is possible on the grounds that it is technically impracticable to permanently restore the aquifers from an engineering perspective. However, any determination of this type is reserved for future application in the Final ROD only if appropriate. Regardless, the remedy provides adequate controls, in the form of land use and aquifer use controls, and monitoring. These controls together effectively manage the untreated groundwater that will remain on site.

With respect to soil, there are no chemical-, location-, or action-specific ARARs since no active remediation actions would be undertaken with Alternative 69SO-2.

4.3 Cost Effectiveness

Monitoring and institutional controls provide a cost-effective remedy for Site 69. Only minimal costs associated with administrative efforts and implementation are anticipated. Land use and aquifer use controls provide a cost-effective remedy since there are no significant costs, other than administrative-type efforts, associated with their implementation. Based on the nature and extent of contamination at Site 69, as well as the site's current and expected future use, the other treatment alternatives developed for these sites would not provide significantly more protection of human health and the environment; whereas the present-worth costs estimated for these alternatives are higher than the selected groundwater alternative.

4.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The selected alternative for groundwater would provide a permanent, long-term remedy through treatment by natural attenuation, and the provision and enforcement of groundwater monitoring and institutional controls (aquifer use restrictions and "Notice" recordation requirements) at Site 69.

Although contaminants detected in the groundwater have not met Federal and State standards, the presence of a continuing source that cannot yet be removed may prohibit achievement of State or Federal groundwater standards. A waiver of Federal ARARs is possible on the grounds that it is technically impracticable to permanently restore the aquifers from an engineering perspective. However, any determination of this is reserved for future application in the Final ROD only if appropriate.

4.5 Preference for Treatment as a Principal Element

The selected groundwater remedy for Site 69 satisfies the preference for treatment by utilizing the alternative treatment technology of monitored natural attenuation. However, the source of groundwater contamination cannot be removed due to the presence of CWM. CWM (CAIS) can feasibly be removed by the Design Center for Ordnance and Explosives Team. However, final disposal facilities for such waste generated by military bases are not readily available. Therefore, should the CWM be excavated, it would have to be stored indefinitely at Camp Lejeune. Commercial transportation and disposal facilities for military generated CWM waste may be available in the near future. A concurrence letter from the Army Corps of Engineers supporting the decision in this Interim ROD is presented in Attachment A.

5.0 RESPONSIVENESS SUMMARY

5.1 Overview

The Final PRAP (May 1998) addressed Site 69, the Rifle Range Chemical Dump, OU No. 14. Groundwater contaminated with chlorinated solvents makes up OU No. 14. At the time of the public comment period, MCB, Camp Lejeune and the DoN selected Institutional Controls and Monitored Natural Attenuation as the preferred alternative for the contaminated shallow and upper portion of the Castle Hayne aquifers. The preferred alternative presented in the Final PRAP is the same alternative presented in this Interim ROD.

Comments received at the public meeting indicate some concerns about certain aspects of the selected alternative, but no objection to its implementation. No written comments were received during the public comment period.

The purpose of this responsiveness summary is to identify the comments and concerns of the local community regarding the selected remedy, and to document how MCB, Camp Lejeune/DoN considered these comments and concerns during the selection of the remedy. The remainder of this responsiveness summary discusses the background on community involvement, and presents a summary of the comments received during the public meeting and public comment period along with their corresponding responses.

5.2 Background on Community Involvement

No past community interest in the contamination at Site 69 has been documented. This may be due to the fact that the site is located within an isolated, heavily wooded area at the MCB.

5.3 Summary of Comments and Responses

Comments raised during the Site 69, OU No. 14 public comment period and the public meeting are discussed below. The comment period was held between June 19, 1998 and July 20, 1998. No written comments were received during this comment period. The public meeting was held on June 30, 1998. Comments were received from private citizens at this meeting and are summarized in the following paragraphs along with MCB, Camp Lejeune's response. The actual transcript from the public meeting is provided in Attachment B.

Two private citizens made comments at the public meeting. The general topics raised by their questions include costs of alternatives; budget and duration of groundwater monitoring; sample locations; rationale for choosing the selected alternatives; fate and transport of contaminants; and site review and contingency plans. The questions and answers are paraphrased below.

Costs of Alternatives:

Question:
What are the costs of each alternative? What is the difference between capital costs and net present worth costs?

Answer:
The costs of each alternative are presented in the PRAP and in the public meeting transcript.

A capital cost is a cost required for the design and the construction of the remedial action alternative. This includes the costs of materials, labor, and equipment. The net present worth cost includes the capital costs and the annual operation and maintenance costs. The annual operation and maintenance costs are defined for the first year of operation in terms of the value of the dollar in the current year. These costs include the cost of material, labor, and equipment required to operate and maintain the alternative over a course of 30 years. The 30 year duration was assumed only for costing purposes but could be longer or shorter, depending on how long it takes for natural attenuation processes to break down the contaminants.

Budget and Duration of Groundwater Monitoring:

Question:
What duration of groundwater monitoring is included in the budget? What happens at the end of 30 years?

Answer:
For costing purposes, groundwater monitoring was assumed to be for a period of 30 years. However, monitoring will probably be forever. The subsurface investigation was not as thorough as usual because of the site access restrictions imposed by the Army due to the risk of encountering chemical agent test kits. Because of the possible release from barrels and test kits that have not yet corroded, it is impossible to tell what will happen in the future. Therefore, even if the groundwater monitoring indicates that it is clean for several years, the site cannot be categorically considered clean. At the end of 30 years, more money would have to be budgeted for the monitoring of the site. As long as the test kits remain in the ground, the site will have to be monitored.

Sample Locations:

Question:
What are the locations of Everett Creek and the New River? Is there another canal near the site?

Answer:
Everett Creek is about a quarter of a mile south of the site. The New River is a little closer - about 200 yards away. The canal [on the slide shown at the meeting] is an intermittent natural drainage way. There are actually two intermittent natural drainage ways. One flows to Everett Creek and the other flows north to an unnamed tributary. Water samples were taken from both areas and nothing was found at either of them. In the 1980s water samples were taken from small ponds which showed low levels of volatile organic compounds. These ponds are believed to be connected to the water table.

Rationale for Choosing Alternative:

Question:
Why can’t the barrels and test kits be removed and disposed off-site? Does the Navy consider removal of the contaminant source a good or a bad alternative? Is it Army policy not to remove the contaminant source?

Answer:
The Army is responsible for the manufacture, distribution, and clean up of chemical agents. The Army has a policy of not disturbing sites that do not pose imminent risk to human health and the environment. A risk may be posed if the contaminated area were to be disturbed. Currently, this site is not considered to pose an imminent risk. Therefore, it is Army policy not to disturb the site. Further, the Navy does not have the technology to monitor for the chemical agents and therefore, cannot do anything at this site without the Army's assistance. The Army would be the agency that would have to contract the work, not the Navy.

[**Note:** This answer was based on the information available to the Navy at the time of the Public Meeting. For clarification on the role of the Army in the cleanup of sites with buried CWM, see the concurrence letter presented in Attachment A of this document.]

Fate and Transport of Contaminants:

Question:
What happens to the contaminants in the groundwater? Are the shallow, intermediate, and deep aquifers connected? Are the contaminants being broken down or just diluted as they disperse through the groundwater? Will the dropping of the aquifer level (due to high use of the aquifer) spread the contaminants?

Answer:
The contaminants were found from 30 to 40 feet up to 60 to 70 feet all in one area. The contaminants are believed to bind to the clayey-type soil so they don't move. The waste has been buried at the site since 1950 through 1976 and it hasn't moved very far, most likely due to the clay. The groundwater moves but the contaminants are staying in a small area.

There is interconnection between the aquifers. The shallow aquifer is separated from the intermediate aquifer by a semi-permeable layer of clays, silts, and sands. Contaminants spread from the shallow to the deep aquifer because the separating layer is semi-permeable.

The solvents are broken down and diluted. Both of the effects act together to decrease the contaminant levels.

When the water table drops below the contaminated area, the groundwater will no longer be in contact with the contaminants. Therefore, if the water level drops, the contaminant levels will not be able to increase because the source of groundwater contamination will effectively be "removed". The contaminants will not spread.

Site Review and Contingency Plans:

Question:
What happens if the contaminant levels don't decrease?

Answer:
It is possible that contaminant levels might increase if some barrels rust through. But so far, contaminant levels detected only a couple of hundred feet from the site have decreased to levels that are nondetectable. If contaminant levels start to increase, some action would have to be reconsidered, such as a groundwater barrier outside the site (because no disturbance would be allowed inside the site boundary without the Army's assistance). The monitoring program is

designed to detect such releases and to determine if natural attenuation is occurring or not. The monitoring program will ensure that the contaminants won't escape from the site and cause a risk of exposure.

6.0 REFERENCES

USEPA, 1996. United States Environmental Protection Agency. Soil Screening Guidance: Technical Background Document, EPA/540/R-95/128, Office of Emergency and Remedial Esponse, Washington, D. C. May 1996.

TABLE 1
GLOSSARY OF EVALUATION CRITERIA
MCB, CAMP LEJEUNE, NORTH CAROLINA

- **Overall Protection of Human Health and the Environment** - addresses whether or not an alternative provides adequate protection and describes how risk posed through each pathway are eliminated, reduced, or controlled through treatment engineering or institutional controls.

- **Compliance with ARARs/TBCs** - addresses whether or not an alternative will meet the applicable or relevant and appropriate requirements (ARARs), criteria to-be-considered (TBCs), and other federal and state environmental statutes, and/or provide grounds for invoking a waiver.

- **Long-Term Effectiveness and Permanence** - refers to the magnitude of residual risk and the ability of an alternative to maintain reliable protection of human health and the environment overtime once cleanup goals have been met.

- **Reduction of Toxicity, Mobility, or Volume Through Treatment** - refers to the anticipated performance of the treatment options that may be employed within an alternative.

- **Short-Term Effectiveness** - refers to the speed with which the alternative achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may occur during the construction and implementation period.

- **Implementability** - refers to the technical and administrative feasibility of an alternative, including the availability of materials and services required to implement the chosen solution.

- **Cost** - includes capital and operation and maintenance costs. For comparative purposes, net present worth-values are provided.

TABLE 2

GROUNDWATER REMEDIATION LEVELS AT SITE 69
INTERIM RECORD OF DECISION, CTO-0212
MCB CAMP LEJEUNE, NORTH CAROLINA

Contaminant of Concern	RL[1]	Basis
Trichloroethene	2.8	NCWQS[2]
Total 1,2-Dichlorethene	70	NCWQS
Vinyl Chloride	0.015	NCWQS
Beryllium	4	MCL[3]
Chromium	50	NCWQS
Lead	15	NCWQS
Maganese	50	NCWQS
Vandium	110	Risk-Ingestion
Zinc	2,100	NCWQS

Notes: [1] RL=Remediation Level
Groundwater RLs expressed as Fg/L (ppb).
[2] North Carolina Water Quality Standard
[3] Maximum Contaminant Level

FIGURES

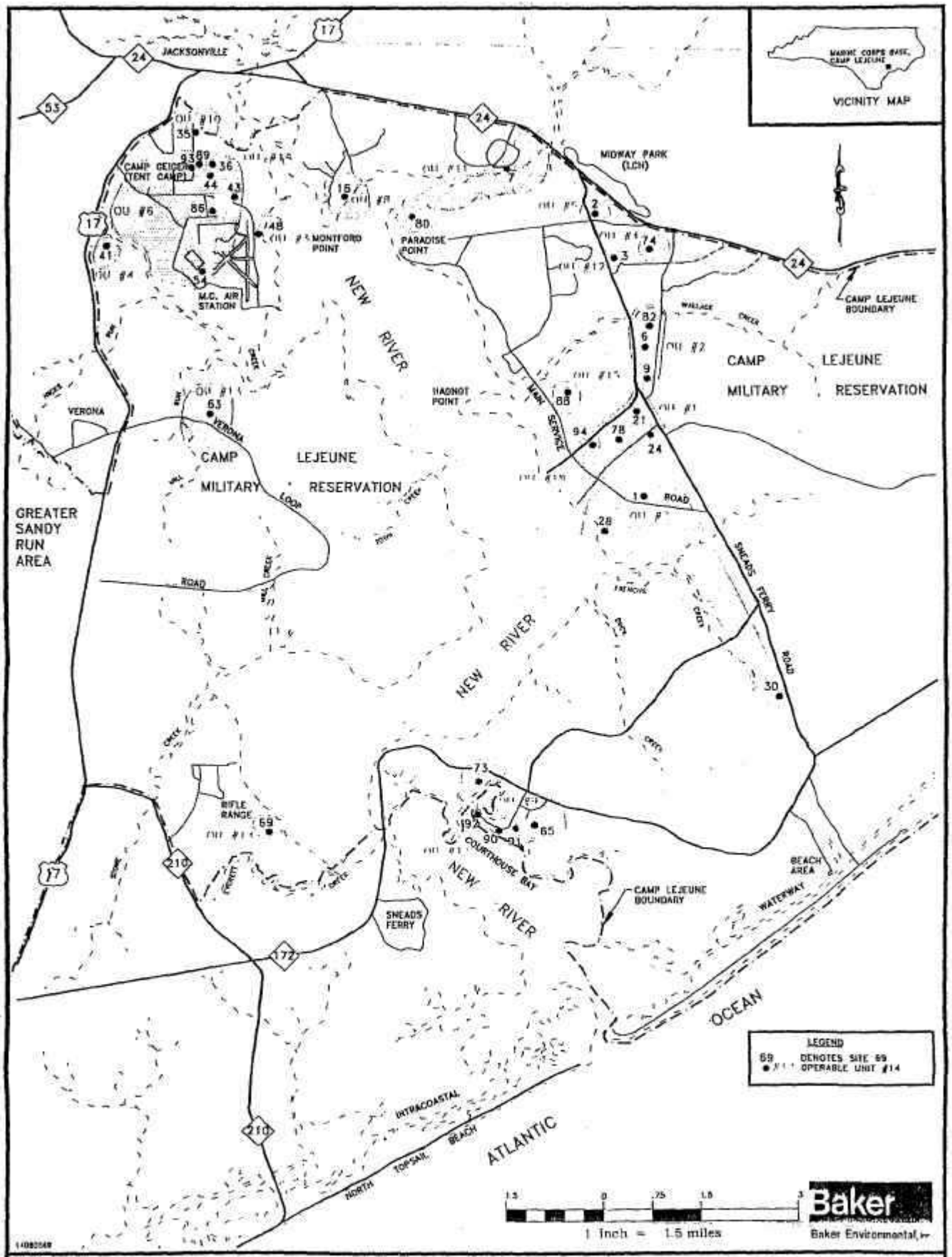
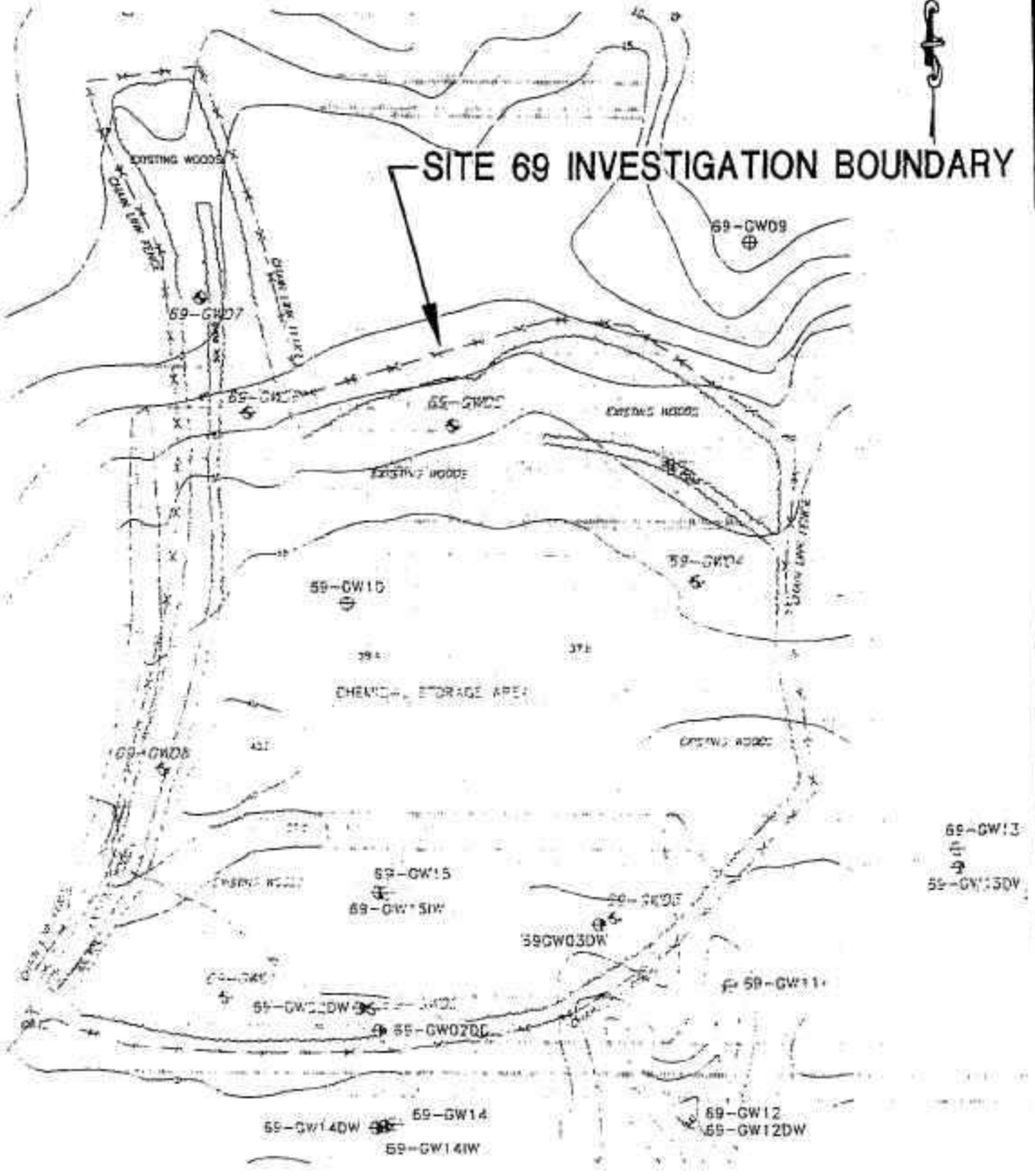


FIGURE 1
OPERABLE UNITS AND SITE LOCATIONS AT
MARINE CORPS BASE CAMP LEJEUNE
RECORD OF DECISION CTO – 0212

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



200 0 100 200 400

1 inch = 200 ft.

Baker

Baker Environmental, Inc.

LEGEND

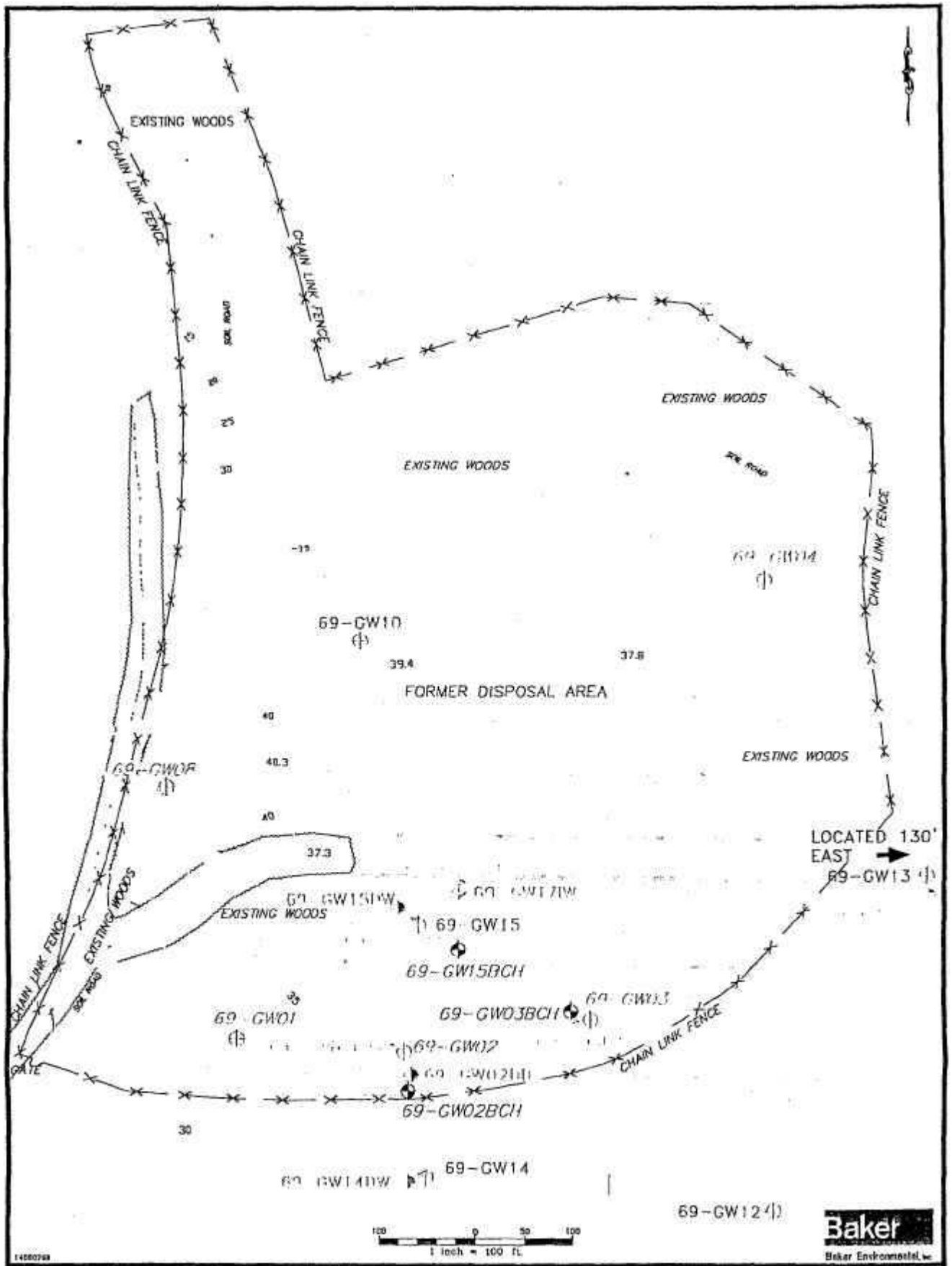
69-GW02

- EXISTING SHALLOW WELLS
- PROPOSED DEEP WELL
- PROPOSED SHALLOW WELL
- PROPOSED PAIR OF SHALLOW AND DEEP WELLS
- FENCE
- VEGETATION
- TOPOGRAPHIC ELEVATION LINES (FEET, MSL)

SOURCE: REVISED FROM LANTDIV, OCT. 1991

FIGURE 2
SITE MAP
SITE 69 – RIFLE RANGE CHEMICAL DUMP
RECORD OF DECISION CTO – 0212

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



LEGEND

69GW15BCH — DEEP ZONE CASTLE HAYNE WELLS

69GW09 — SHALLOW WELLS

UPPER ZONE CASTLE HAYNE WELLS

69-GW12DD — INTERMEDIATE ZONE CASTLE HAYNE WELLS

30 — TOPOGRAPHIC ELEVATION LINES (FEET, MSL)

SOURCE: REVISED FROM LANTDIV, OCT. 1991

FIGURE 3
PROPOSED MONITORING
WELL LOCATIONS
SITE 69 - RIFLE RANGE CHEMICAL DUMP
RECORD OF DECISION CTO - 0212
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

ATTACHMENT A
U.S. ARMY CORPS OF ENGINEERS LETTER

DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
P.O BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF:

14 September 1999

Design Center for Ordnance
and Explosives Team

Baker Environmental, Incorporated
ATTN: Ellen Bjerklie
Airport Office Park, Building 3
420 Rouser Road
Coraopolos, Pennsylvannia 15108

Dear Ms. Bjerklie,

As requested by the Department of the Navy, I have commented on the Interim Record of Decision for Operable Unit No. 14 (Site 69, Rifle Range Chemical Dump) Marine Corps Base, Camp Lejeune. Although I cannot speak for "the Army", I have discussed this issue with members of my Chemical Warfare Materiel Team and with staff members in the Office of the Deputy Assistant Secretary of the Army, Installations and Environment. The conclusions that were reached are as follows.

As there are currently no indications of exposed Chemical Agent Identification Sets (CAIS) and there is security and control of the site, there does not appear to be an imminent and substantial hazard readily accessible. The unearthing, of CAIS would require indefinite storage somewhere on the installation, while awaiting disposition, which may not be readily forthcoming. Transporting CAIS to a commercial facility for disposal may be more acceptable in the near future based on studies by the National Research Council.

I therefore agree with your Interim Record of Decision pending additional capability by the Department of the Army in dealing with Recovered Chemical Warfare Materiel.

Respectfully,

Charles L. Twing
Chemical Warfare Materiels
Team Leader, U.S. Army
Corps of Engineers

ATTACHMENT B
PUBLIC MEETING TRANSCRIPT

MARINE CORPS BASE
CAMP LEJEUNE

TRANSCRIPT
OF
PUBLIC MEETING
PROPOSED REMEDIAL ACTION PLAN
(PRAP)
OPERABLE UNIT NO. 14

Coastal Carolina Community College
Fine Arts Auditorium
June 30,1998
7:00 P.M.

REPORTED BY: Julie R. Ryan, CVR

Cape Fear Court Reporting, Inc.
P. 0. BOX 1256
Wilmington, North Carolina 28402
(910) 763-0576
1-800-223-8834
FAX: (910) 341-5183

COPY

TABLE OF CONTENTS

P R 0 C E E D I N G S 7:10 P.M.

MR. MICK SENUS: It's about ten after seven, so I suppose we can get started. I think everybody that's coming is here.

I'd like to welcome everybody to the public meeting for the proposed remedial action plan for OU 14 and OU 6. First I'll make some introductions of base representatives and people from the State that are here. If you could just raise your hand or hi sign. I'll first start. My name is Mick Senus, and I'm a base employee. I work for the Environmental management Office Installation Restoration Division.

Mr. Scott Brewer is the Deputy to the Assistant Chief of Staff at EMD. Neal Paul is the Installation Restoration Director. Brian Marshburn also works in Installation Restoration as a Project Manager. And Tom Morris, Installation Restoration Project Manager.

From North Carolina Department of Environment and Natural Resources, Superfund Section, is Dave Lown and Jack Butler.

From LANTDIV Kate Landman is here and Maritza Montegross.

Our environmental contractors from Baker Environmental, Tom Trebilcock is here. He's Program Manager for Camp Lejeune. Ray Wattras is here who is a Project Manager for OU 14. Rich Bonelli is here for OU 6; he's Project Manager.

And Kathy Chavara is here as Project Engineer.

The purpose of the meeting is to disseminate information on OU 6 and OU 14. The first presentation will be OU 14, and followed by Rich Bonelli and Kathy Chavara on OU 6. If there's anybody that has any questions throughout the presentation, those questions are welcome. We do like to ask you to state your name for the record so that our court reporter, Julie, can have your names accurately and we're able to respond to your questions after this meeting and after tonight.

One last thing is the public comment period opened on June 28th, this past Sunday, and will go for 30 days, until July 28th.

The PRAP, if you don't have one already, for both OUs is on the corner of the stage. And for anyone else, there is one in our office at Camp Lejeune, Building 58. Any questions, the phone number is 451-5068. You can ask for myself or Neal Paul.

And if there's no questions, we can move into the presentation of Ray Wattras, OU 14.

MR. RAY WATTRAS: Thank you, Mick. I'm Ray Wattras; I'm the project manager for Operable Unit Number 14, which is Site 69. Rich, if you can go to the next slide.

Site 69 is referred to as the -- you may not be able to read this. It's referred to as the Rifle Range Chemical

Dump. It's located south of the rifle range area at Marine Corps Base, Camp Lejeune. It's located about 200 yards from the New River and just north of Everett Creek. Everett Creek flows right here into the New River; the site being up in this area. Next slide, please.

The site has a recorded history dating back to about 1950 through 1976 where a variety of wastes were taken up to the site and disposed of, typically in the trench and fill operation. These wastes included PCBs; solvents which were used in degreasing operations; pesticides; and what makes this site unique is the fact that it's reported that chemical agent training kits were taken up to this site. Now, that's important to know because these training kits, most of them contain small doses of chemical agents, blister-type agents. They would use that in training of the military personnel. So, because of that we had to approach this site a lot differently than we do most sites; the main point being we have to study this site in conjunction with the U.S. Army. The U.S. Army policy was if you have chemical agents, even the test kits, in test kit small doses, they don't want to, basically, uncover it unless it presents an imminent danger to human health and the environment. In this case it doesn't up at this site.

This site is located in a remote area. This is a historical photograph taken back in 1956. It just shows you pretty much the outline of the site. This is just disturbed

ground. Here it shows the trench in this area; another trench up in this area. They'll point out different things like a possible staining area, mounded material; that could be anything from just a pile of dirt that they dug out. The same thing up here it says mounded material. From the aerial photograph, especially taken back in 1956, you really can't tell exactly what it is. So, they tried their best, and it helps us to study this site, gives us a feel for how the wastes were disposed of and so forth.

Back in the ´80s is when the first investigations began. They started off with just a series of about eight shallow monitoring wells to see if the groundwater was impacted. And what we found was the groundwater in the southern part of the site, south central part of the site, had some very high levels of volatile organics such as trichloroethene; and I'll refer to that in this presentation as TCE. That's the acronym that you'll hear myself and probably others refer to TCE and vinyl chloride. Those are pretty common constituents of the solvents that they used.

We began studying this site in about 1993-1994. We started by doing a geophysical survey and using instruments to try to detect where the buried material might be. We did have reports, you know, that the material was taken up in drums. So, we tried to locate that, and we did find quite a bit of buried material throughout -- mainly throughout the central part and

southern part of the site we found a lot of anomalies with the instruments.

Our objective was to let’s find out how contaminated the groundwater is, you know, has it migrated off site. We did know, as I mentioned previously, that two wells in this area showed some high levels of TCE and vinyl chloride. So, what we tried to do is to determine has it migrated off site. Then we established -- we put some wells down in this area, down in the southeast part of the area, pretty much surrounded the site. We put a cluster of wells between the site and the New River, which is off the photo here, as well as some deeper wells.

Not only did we need to find out has it migrated in the shallow aquifer, but we wanted to know did it actually go and infiltrate into the Castle Hayne aquifer, which is the drinking water aquifer. So, we put in a series of wells. Our deepest well went down to about 230 feet. That’s at the very bottom of the drinking water aquifer.

We also took soil samples, but we had to be careful here. We just couldn’t go in with backhoes and start looking because the Army policy was leave it be, you don’t want to create a major danger or anything like that. So, we did drill a number of bore holes with the assistance of the U.S Army, and as we would drill a bore hole, we would go down about two feet; the Army would put in their instruments to see if they detected any chemical agents coming up from the bore hole. And we didn’t

detect any chemical agents, by the way, and we put quite a number of holes throughout the landfill, mainly to try to find out is the soil contaminated. We put in a series of monitoring wells, again, just to find out what is the extent of this contamination.

With respect to soil, most of the soil samples were taken above the water table. And really, with the exception of one boring in this area, we really didn't find much in the soil, which kind of, you know, you would expect that if they buried it in a trench, and they may have dug down to the water table; when they hit the water table, they probably stopped digging the trench, and then they put their waste in there and covered it up. So, once we hit the water table, you can't really get the soil sample anymore. So, from the standpoint of soil contamination, the surface is pretty -- it really didn't show anything of significance. Like I said, only one subsurface boring showed some contamination with volatile organics, the TCE that I mentioned previously.

We did a study of surface water and sediments. Again, we took samples from down below here. South of this site is Everett Creek. There is an unnamed tributary to the New River that's north of this site, and we also sampled surface water and sediments in the New River, both upstream adjacent to this site and downstream from this site.

We didn't find really any contamination in any of

those surface water bodies that could be attributed to Site 69. We didn't find the TCE or the vinyl chloride or anything like that.

There is one, or two, real small ponds on site. They're always -- from every time I've visited this site, they've always been present, and they're really -- how would I describe this up here -- these ponds are probably not much bigger than the screen, but we believe that they're connected with the shallow water table, that they're hydraulically connected. And we have found low levels of volatiles in those surface ponds, I'll call them; although the levels were below what's called ambient water quality criteria, which is -- there are both federal and state standards for water quality; and although we had volatiles, they were below those levels.

Let me talk a little bit about the extent of contamination. If you can go to the next slide, Rich. What we really found was -- let's start with the shallow aquifer. And if you can see this blue dotted line, this is pretty much the extent of shallow groundwater contamination above what I'll call groundwater standards, the State standards for protection of groundwater. The red circle is what we're calling our suspected VOC source area. That's based on everything from the geophysical study as well as the groundwater results. We had the highest levels in groundwater up in this Well Cluster 15. You can't read that on this figure here, but we had TCE and

vinyl chloride in the parts per million range, which is quite high. But its groundwater flow -- groundwater flow is in the southeast direction. This arrow depicts that. When you get to the wells down in this area of this site, we really picked up very, very low levels of TCE and vinyl chloride. So, we've had a lot of breakdown of the products, for various reasons. The contamination could be hung up with a lot of clayey material meaning it's not really migrating that far. The drums could have opened up over the years by being underground. But the wastes from them have not impacted the groundwater significant from the standpoint of migration. It's pretty much you get out into this area with these wells down in this area, and they're all low. They're either non-detectable, which means we didn't detect anything in those samples, or they're very, very low levels below groundwater protection standards. So, that's pretty clean.

The green dotted line, though, represents the Castle Hayne aquifer which underlies the shallow aquifer. We did find, again, especially up in this well 15 cluster, we had very high levels of TCE and vinyl chloride at a depth of about 30 to 40 feet below ground surface. And that's called -- we refer to that as the top of the Castle Hayne aquifer. We put another series of wells in just a little bit deeper than that, say 60 to 70 feet, and we found -- we still found TCE and vinyl chloride, but at much lower levels.

Now, all of the Castle Hayne wells that are in this area, it’s down gradient and outside, at least the fence line. It’s beside a boundary. We really didn’t find anything in the Castle Hayne aquifer, which is good.

So, what we have here, the problem with this site is the fact that we do have a probable source area that we cannot get to because we cannot uncover this material. It is impacting groundwater, but in a very localized area. So, it hasn’t really migrated too far from the original source area.

From a standpoint of what are the risks to human health that this site presents, the site, number one, is in a remote area of the base. It’s really isolated. Other than perhaps trespassers, there is no activity; there is no residential housing nearby; there’s no commercial or industrial operations going on nearby. They do train in the area. We’ve seen vehicles and training maneuvers. There is a fence around this site, and the fence has signs posted on it with, you know, "warning," “(no) trespassing.” So, from a current standpoint the site isn’t really presenting any type of risk.

The groundwater, although it’s contaminated, the nearest supply well is more than a mile away from the site. And again, we have a pretty good handle on the fact that it’s not contaminated, you know, within a couple hundred feet from the site. So, currently the site doesn’t really present a risk to human health. Obviously if somebody came in-here and decided to

develop this site, there would be potential health impacts; number one, if you drank -- if somebody installed a well here, it would not be a good idea, because they would be drinking contaminated water. So, from a future risk standpoint, there are risks associated with groundwater ingestion. It's obviously fairly unlikely. The base is on a public water supply and has been. And the well, as I said, the nearest supply well is more than a mile way. In fact, if I'm not mistaken, it's up near the rifle range, which is pretty far up gradient with respect to groundwater flow.

So, what we decided, we have -- you know, we defined the problem at this site, and now it's a point in time to say well, what are we going to do about this problem.

We looked at soil first, and we said, well, you know, we have a barrier, the fact that we can't do anything invasive here. There are two soil alternatives. One alternative is to do nothing, which is called the no action alternative. And that alternative is always used to measure against other alternatives.

The second alternative with soil is to implement institutional controls where the base would be restricted from developing this area. They would not, obviously -- we'd want the fence to be kept up because we have buried material there. The restrictions would not permit any type of building or anything like that around the site, and that institutional

control would be documented in the Base Master Plan. So, those are the two soil alternatives.

We couldn't consider anything like capping, and there's really no great need to cap the site. As I mentioned before, the surface soil is not the problem here. It's the buried material. Capping would require us to do some grading, remove all of the trees from this site, and therefore, we'd probably have a problem with disturbing the contents. So, we pretty much ruled out capping as being a feasible alternative.

So, with respect to soil, the best thing and the recommended alternative is to just implement some institutional controls to keep the people out from digging up the area or building on it and so forth.

Now, with respect to groundwater, there are five alternatives. Again, the first one is always no action, meaning we would do nothing with the groundwater. In that case, that means no monitoring, no nothing. That alternative presents a little bit of a problem here because we know we have contaminated water, and we want to keep an eye out on that. So, the no action alternative is pretty much ruled out.

The second alternative is called institutional controls and monitored natural attenuation. Now, natural attenuation is a remedial action. It's done in situ. It's done naturally.

Natural attenuation is the natural biodegradation of

the contaminants, the TCE and the vinyl chloride. They break down into other products. It involves dispersion, meaning a dilution. As the plume moves away from the site, those levels are expected to get lower and lower.

When we say monitored natural attenuation, what we mean is we're going to take samples from a series of monitoring wells, both within the source area or the hot area, as well as down gradient. And we want to check those levels over time and see if the level will decrease.

Now, as I mentioned before, this site has been studied since the mid-1980s, and we have seen decreases in the contaminant levels over the last 10 or 12 years. So, we believe there is some natural attenuation that is occurring already, as well as we've seen the breakdown of products that we would normally see from TCE all the way down to the vinyl chloride.

So, that's alternative number two. I believe the net present worth cost of that alternative is around $535,000. That's based on 30 years of monitoring. The first five years you would have to monitor these wells every quarter; and then, after five years, our cost is based, I believe, on sampling the wells twice a year. And then, it also involves a modeling study where we will try to predict, you know, where the plume could be moving or the contaminants migrating or what levels they would be. So, it does involve really a continued study so that you can track what's going on with this plume.

The third alternative involves putting in a series of extraction wells, both in the shallow aquifer and in the Castle Hayne aquifer. We'd want to install one pair of extraction wells near the probable source area, and a series of extraction wells along the boundary. It would require the construction of an on-site treatment plant that would have a capacity of about 100-150 gallon per minute flow. Groundwater would be extracted from the ground from the wells, piped to a treatment facility; treated by using -- you'd have to pretreat to get rid of some of the metals. You have iron that could clog up the air stripper. And you would also treat using air stripper and carbon adsorption. The water would be discharged, piped to the New River. That's the only place -- really to pipe it that's the closest point to pipe it.

That alternative, again, we would -- with that alternative we would still implement institutional controls so that people cannot use the groundwater and put in additional supply wells or anything like that. It would also involve monitoring the groundwater over time just to make sure the plume is not moving, make sure that the extraction wells are contained within the plume. The cost of that alternative is about a little over two million dollars.

The fourth alternative is pretty much what I just described, with the exception of we would install what's called dual phase vapor extraction wells. Vapor extraction wells,

basically, you draw up the soil gas and treat the soil gas. We would most likely install the vapor extraction wells within the probable source area.

The downside of both that last alternative that I mentioned as well as this one we're using, the vapor extraction wells, the source, whatever has caused this groundwater contamination, would always remain there. We cannot physically go in there and remove it like we can at other sites. We're restricted from that because of the chemical agent test kits.

So, using dual phase vapor extraction, the only thing that it does a little bit more than the previous alternative, it will help clean up some of the contaminated soil that is up in this area, but it will not remediate the bulk waste. There's just no practical way that a technology can do that.

That alternative using the vapor extraction has a present worth cost of about 2.7 million dollars.

Finally, the last alternative is referred to as in situ air stripping. In situ air stripping involves installing what looks like a monitoring well. It has a treatment system inside the well. The well creates a circulation of groundwater, and as the water is being circulated from the bottom of the well to the top, there is pretty much -- if you could picture an air stripper inside that well head.

We did a treatability study of that technology. We thought it had some promise. The treatability study had mixed

results. We did see a decrease in -- first of all, it didn't work in the shallow aquifer. We had two different wells. We installed one pilot study well in the shallow aquifer down pretty much around this area, and we installed the one in the top of the Castle Hayne aquifer. We couldn't get a circulation cell to form in the shallow aquifer. It did not work.

Now, in the upper portion of the Castle Hayne aquifer, we were able to form a circulation cell, and we saw some reduction in levels at the well itself; but we didn't really see that much of a reduction in levels in other monitoring wells surrounding it. Part of that theory is if there's a lot of clayey material there, it's possible that a lot of the contaminants, a lot of the waste, bound itself with that clay, and we couldn't move it towards that -- although the circulation cell was formed, it was not moving towards that well. It was bound too tightly to clay. So, we had some mixed results with that treatability study.

At the well itself we did see a reduction, but not too far away. We got 20-25 feet away from that well, we weren't seeing really anything significant happening with respect to lowering the levels of contamination. But anyway, we included that as an alternative.

What we propose doing in this case would be you'd install, we said, a series of wells all in the source area; we would let them operate for maybe two to three months, shut them

down, let them stay shut down for a month or two, start them back up sort of a like a pulse reaction to try to move the contaminants towards that well.

So, we did add that alternative even though the treatability study had mixed results. And that alternative had a present worth cost of about $800,000.

So, in summary, the recommended alternatives for this site: for soil, it's to implement institutional controls to prohibit building and use of the land; and for groundwater, it's institutional controls and monitored natural attenuation. We feel that, from a standpoint of the current risks that the site presents as well as effectiveness of the other technologies, that this would be the most feasible way to approach this site for this time being.

Are there any questions? Yes, sir.

MR. JOE BARNETT: What was this cost? I wasn't sure again. Capital costs, annual, I wasn't sure what that comes to.

MR. WATTRAS: Okay. For which particular alternative?

MR. BARNETT: Just any of them. I wasn't sure.

MR. WATTRAS: Okay. Let's start with soil. Obviously no action there's no cost. And I apologize, I do not have a slide. I think Rich has a slide for his costs, but I did

not prepare one.

For institutional controls with soil, there is no capital cost, but there's an annual operation and maintenance cost, and that's really just upkeeping of the fence and so forth. That's about $900 a year. And the net present worth cost was just under $14,000 total. That's for soil.

MR. BARNETT: What's net present worth cost mean? Is that like a one-time cost?

MR. WATTRAS: Yeah, that would be one-time cost, and we'll put that money aside today, and that should be enough, based on $900 a year for 30 years, to last at a, I think, interest rate of six percent.

For groundwater, again, no action has no costs. Okay? For the recommended alternative which is institutional controls and natural attenuation, there is no capital cost, again, with that one, because we feel we have enough wells out there we would not need to put any more in. But we do have an annual operation and maintenance cost which is mainly the collection of samples, the analysis of those samples. $63,000 a year for the first five years, because I believe we're going -- we propose to monitor that quarterly. And for years 6 through 30 it would be $24,000 a year because we're only sampling, I believe, twice a year. And the net present worth, again, was $535,000 for that alternative.

Now, the alternatives, beginning with groundwater

alternative number three, that's where we would have to install some extraction wells and a treatment facility, the capital cost is $1,047,000. The annual O&M cost would be $67,000. And that had a net present worth cost of $2,088,000.

The alternative which is very similar to that one, to the extraction and treatment, that's the dual phase vapor extraction, that had a capital cost of $1,238,000; and it had an annual maintenance, O&M cost, of about $98,000.

And finally, the last alternative, that was the in situ air stripping, had a capital cost of $246,000, and an annual O&M cost of $39,000.

MS. KATE LANDMAN: Did that answer your question on the definition of --

MR. BARNETT: Okay. Except for the only question I had, the capital costs and net present worth costs, I wasn't sure what the difference in that was.

MR. WATTRAS: Capital costs would be if we have to put in a treatment plant, you have to install it, construct it, that's the capital cost; whereas the net present worth cost includes your O&M costs extended over a period of 30 years.

MR. BARNETT: So, that's kind of like the total cost, then, isn't it?

MR. WATTRAS: Yes, exactly. That is the total cost.

MS. KATE LANDMAN: Okay. So, it's the capital cost which is the amount I'd have to lay out today to construct a building, plus if I have to spend $63,000 a year every year for 30 years, then that all brought back at a six percent interest rate to today's dollar is the net present.

MR. BARNETT: I got it.

MR. JIM SWARTZENBERG: Jim Swartzenberg is my name. Let me ask a series of questions. I'm trying to follow what you're saying, and I read over this. How close is Everett Creek?

MR. WATTRAS: I think it's about -- I think it's in there, but

MR. SWARTZENBERG: Roughly, I mean.

MR. WATTRAS: About a quarter mile south.

MR. SWARTZENBERG: Quarter mile? It's not as far as -- I think you said New River was --

MR. WATTRAS: The New River is actually a little closer.

MR. SWARTZENBERG: New River is closer.

MR. WATTRAS: It's about 200 yards away.

MR. SWARTZENBERG: Isn't there a canal? Didn't I see a canal on something?

MR. WATTRAS: Go back one. What you saw here was a natural drainage...

MR. SWARTZENBERG: Yeah.

MR. WATTRAS: ...which is a swell. It's not -- I would call it intermittent. In fact --

MR. SWARTZENBERG: Oh, it was on this picture, yes.

MR. WATTRAS: You'll see ponded water in here, you know, not this time of year...

MR. NEAL PAUL: It's seasonally drained.

MR. WATTRAS: ... according to the way the weather's been around here, but it's not a brief flowing stream. It's basically a drainage channel or a swell, as I would call that. And that will lead down to Everett Creek, by the way. That goes all the way down to Everett Creek.

MR. SWARTZENBERG: Has that ever been tested, the water in that ever been tested?

MR. WATTRAS: We pulled -- I'm trying to think. We did test it, but we used -- what the heck did we do there? I want to say the water has been tested. We didn't find anything in there, but I don't have that full report in front of me. Nothing rings a bell that that was a problem.

MR. SWARTZENBERG: Okay.

MR. WATTRAS: And there's actually another one more -- you can see it -- barely see it on here.

MR. SWARTZENBERG: Yeah.

MR. WATTRAS: There's another drainage swell that flows north to that unnamed tributary. We pulled

samples from that area. And I don't believe we found anything in that water also.

The only water, as I mentioned, though, even back in the mid-1980s when we studied this site, and there were a few on site real small ponds, we took samples from those ponds, again, and they still had low levels of volatile organics. And we feel pretty confident that those ponds are tied into the water table. They were pretty low, and probably what we saw there was the water table in those ponds. So, this water puddles, it formed when it rained; every time I've been out there I've seen the ponds. There's always some water in it, and they did have low levels of volatiles in there.

MR. SWARTZENBERG: Why can't you go in there and just dig out where these barrels and training kits were put in there and load them on a truck and send them off to Indiana or somewhere else?

MR. WATTRAS: Well, it's basically, the way I could describe it would be the U.S. Army policy is not to disturb that if it doesn't create an imminent risk to human health and the environment. And right now in the realm of things, this site is very, very low priority for the U.S. Army. They have a lot bigger problems with major quantities of mustard gas and blister agents at other sites throughout the nation. And they basically say don't dig it up unless you have to, because you do run a risk in doing that, obviously. And we

don’t want to create a risk where we don’t have one right now. That is part of the theory behind it, I think, is they don’t want to create a risk if you don’t have one right now; nor do they foresee this site creating a risk like other sites that they have, which might be literally next to a residential area and they have to do something. So, that’s pretty much --

MR. SWARTZENBERG: The reason you’re saying that you’re not considering that as an alternative is because of the Army policy.

MR. WATTRAS: That’s correct.

MR. SWARTZENBERG: Not because it’s a good or bad alternative. You’re just not considering it, period, because of the Army policy, right?

MR. WATTRAS: Pretty much so, and it does not create -- there is no risk being created right now from the stuff that’s buried there, the chemical agents that are buried there.

MR. SWARTZENBERG: I understand that, but what you’re telling me is that you’re not considering it because it’s the Army policy.

MR. WATTRAS: Pretty much so.

MR. PAUL: And that policy is done by DoD, and that’s something we can’t challenge.

MR. SWARTZENBERG: Okay.

MR. WATTRAS: Yeah.

MS. LANDMAN: Kate Landman, from LANTDIV. I just want to add here that we don't have the technology to go out to this site and do anything safely without the Army's assistance. Therefore, it's not feasible for us to go out and do something to this site because we can't do it. We don't have the technologies to monitor for the agents. Every time we drilled a hole in the ground just to test the water, we had to have the Army come out to sniff for us. And we literally don't have any way of going after anything at this site without their assistance.

MR. WATTRAS: And correct me if I'm wrong, we -- the Navy, I say "we" -- the Navy, we are not permitted to go after it. It's the U.S. Army's...

MS. LANDMAN: That's right.

MR. WATTRAS: ... property. They were responsible for the manufacturing of it, the distribution of it, and the clean-up of it. So, even if we wanted to go in there, if we did, it would not -- it would be a problem. It is their responsibility, and they -- I don't want to use the word "own it," but they're responsible for that, and that is their policy, and that's why we, you know, we couldn't do anything there. And understand how that -- you know, the policy, to some extent, makes some sense because it's not a high risk site. And like I said before, with all the other sites that they have --

MR. SWARTZENBERG: But even if it were, you

couldn’t do anything about it?

MR. WATTRAS: The Army would have to assist us.

MS. LANDMAN: Not today.

MR. WATTRAS: In fact, the Army would say it’s illegal --

MR. SWARTZENBERG: You can’t contract something like that out?

MR. WATTRAS: Pardon me?

MR. SWARTZENBERG: You can’t contract that out?

MR. WATTRAS: The army would -- they wouldn’t even let us do that. They would contract it out.

MR. SWARTZENBERG: They would contract it.

MR. WATTRAS: That’s a special type of waste that you have to have special expertise in dealing with it, and the Army’s involved with all of those clean-ups.

MR. SWARTZENBERG: Okay.

MS. LANDMAN: This is one site that is never going -- in our lifetime it’s not going to go away as a site. I mean, there are contaminants out there. We don’t know completely what’s out there. All we have are written reports that these chemical agent test kits are buried out there. We have records that say that. We have not encountered any in our investigation. so, our investigation has not been -- the subsurface investigation has not been as thorough as a normal

site would be because of the limitations imposed on us by the Army.

MR. SWARTZENBERG: So, you're going to monitor this for 30 years.

MS. LANDMAN: No, we're going to monitor it probably forever or until the Army moves us up on their list, technology changes, we have accessibility. This is one site that is not, you know, monitor until you-reach a clean state and then be able to say it's clean. We could have clean readings multiple years in a row, and we couldn't categorically say the site is clean.

MR. SWARTZENBERG: But what you're budgeting for is monitoring for 30 years.

MR. WATTRAS: Yes. The 30 years –-

MR. SWARTZENBERG: At the end of 30 years you've got to budget more money, is that it?

MR. WATTRAS: Well, that's what you would have to do. And every five years, I believe -- well, every year you would really -- we'd have a report coming out every year, basically, showing the progress or lack of progress that the natural attenuation is taking. But as long as it's there, the Navy will have to monitor it.

MR. SWARTZENBERG: What happens if the -- and maybe you've already answered this. What happens if these levels don't decrease? And maybe you've already answered this.

They probably won't, right?

MR. WATTRAS: Well, we hope that they decrease. We're seeing, fortunately -- you want to hit the next slide, Rich. They've decreased to levels that are non-detectable only a couple of hundred feet from the site.

Now, say five years from now we start seeing that the levels are starting to increase here, then we would probably have to, you know, consider -- we might have to consider doing something at that point, containing the flow of groundwater. But for right now there's been 10-12 years of data showing that we really haven't seen -- we've actually seen levels in these wells and in these wells increase significantly over the last ten years. So, but you never know what can happen.

MR. SWARTZENBERG: These could be in some barrels that...

MR. WATTRAS: Exactly.

MR. SWARTZENBERG: ... haven't rusted through yet.

MR. WATTRAS: Exactly. That could be the case.

MR. SWARTZENBERG: When they do, then you could --

MR. WATTRAS: That could be the case.

MS. LANDMAN: So, five years from now -- our monitoring program was designed so that we can detect if,

say, a big new slug were to come out from the source area. And if that were the case and we started to see a significant plume starting to migrate off site, we might have to do something in the form of a barrier, which would be outside the site because we can't do anything within the site.

MR. WATTRAS: But there's nothing suggesting that yet.

MS. LANDMAN: So, we would have to reevaluate that situation as it arose because it wouldn't do any good to put -- we might decide to install a protective barrier system right now, and it might be in the wrong place. We don't know. And as long as we have a relative equilibrium at the site right now, and contaminants don't appear to be leaving the site, it appears that what contaminants have been released at the site are naturally attenuating before they make it off site. And as long as that equilibrium is maintained, we won't really have a problem regarding risks for contaminants escaping the site. And part of the monitoring program is to insure that those conditions don't change, and if they do change, it will alert us early enough so that we can take action to prevent any exposure.

MR. SWARTZENBERG: One last question.

MR. WATTRAS: Sure.

MR. SWARTZENBERG: Maybe Katherine can answer this. I don't know, I mean, whatever. You said you dug wells. Some of these wells detected high levels of TCE at 30 to 40

feet; that's what you had said.

MR. WATTRAS: That's what we call the upper zone of the Castle --

MR. SWARTZENBERG: So, they are in the aquifer?

MR. WATTRAS: Yes, they are.

MR. SWARTZENBERG: What happens to that water, because the water evaporates, right?

MR. WATTRAS: Well, groundwater is moving. Part of the theories, although we have it at 30 to 40 feet, we even have it at 60 to 70 feet, but it's only in this one area, okay? We have wells out here that are 60 to 70 feet. We have wells out here that are 60 to 70 feet and deeper; we haven't seen it out here. Part of the theory is we believe there's a lot of clayey-type soil up at this site, and contaminants will bind to that clay, you know, it will bind them and they won't move as readily as, say, sandy-type soil.

So, that's part of the theory, but we have to remember, this waste has been buried since 1950 through 1976, and it's somewhat surprising that it hasn't moved much further off site, which is good, and we think the reason for it might have to do with the type of material, the geologics of the clays and stuff like that that might be binding that contaminant from the groundwater.

MR. SWARTZENBERG: You really don't know?

MR. WATTRAS: You can't tell for certain.

MR. SWARTZENBERG: A lot of guesses.

MR. WATTRAS: That's a theory. We do know -- the facts are it's clean out here, so it's not moving. I mean, it has not been detected out here.

Groundwater is always moving, obviously, but the contamination has stayed pretty much -- here's the Castle Hayne, this green color is the drinking water aquifer. This is pretty much our estimated extent of contamination in the drinking water aquifer, and this is our estimated extent of contamination in the shallow aquifer.

Yes, sir?

MR. BARNETT: Joe Barnett. That Castle Hayne, the shallow and the deep and intermediate, is it like a big bathtub and it's all the same water?

MR. WATTRAS: The shallow aquifer is, separated by a semi-permeable layer of clays, silts and sands. It's not totally isolated. I'm not sure at Camp Lejeune, I mean, there are a lot of aquifers around the country that are -- you can have a shallow aquifer, then you can have two or three feet of clay, and you can have another aquifer underneath, and they're not interconnected hydraulically.

We feel pretty certain from the testing that we did out here, we do have -- it's a fact that we have contamination in the shallow and in the deeper Castle Hayne. There is an interconnection between the aquifers.

MR. BARNETT: I personally think your alternative is probably the best one, but what I'm wondering, what else -- I mean, if you have some pollution like in one end of the bathtub, it just disperses enough, does it break them down or is it just getting diluted and your wells don't detect it because it's...

MR. WATTRAS: It's a little bit of both.

MR. BARNETT: ... diluted so much you can't detect it?

MR. WATTRAS: It's a little bit of both. It's dilution as well as just the break-down of the solvent itself.

MR. BARNETT: But it does break down some of it?

MR. WATTRAS: It does break down, yeah.

MR. BARNETT: And another question is, you know, I keep reading about -- I brought this up a long time ago, but supposedly as our aquifers -- you know, we're using a lot of it and it's dropping, will that tend to spread it more?

MR. WATTRAS: Actually if the shallow -- you know, if your water table dropped below where your wastes are, that's actually good, in a way, because now there's no -- you know what I'm saying?

MR. BARNETT: Okay. So, it might -- except where the --

MR. WATTRAS: You might have a better condition if your shallow water table dropped because there's no longer any contact with that waste material. Okay?

We haven't studied the site -- I mean, we haven't looked at those groundwater levels over time to try to get any type of pattern. There are seasonal fluctuations in groundwater. Maybe Rich can help me here. I don't think they fluctuate more than a foot or two out, out at this site, from what I recall.

So, to answer your question about the water levels, if anything if the water levels go down, that would actually be better because you'd have your wastes that would now be above the water table and no longer in contact. But they do fluctuate seasonally.

MR. BARNETT: So, what's already in the water, though, that might get dispersed more.

MR. WATTRAS: Yes.

MR. BARNETT: But what's not in the water, it might keep it from getting in the water?

MR. WATTRAS: That's correct.

MR. BARNETT: Except when it rains, then it might.

MR. WATTRAS: Rain would cause some infiltration.

MR. SENUS: Ray, can I interject? It's

been about an hour already. Does anybody have any objections if we move to OU 6? We have five more sites to do. In the interest of time. If there are any questions about site 69 we can entertain that at the end, either formally or informally, depending on how much time is left.

MR. WATTRAS: Or written comments, I guess there's -- on the back of the sheets there's an address if you have any other questions, feel free to write those questions in and we'll answer them.

Thank you. And I apologize for taking more than 15 or 20 minutes.

(THIS CONCLUDES THE PUBLIC MEETING FOR OPERABLE UNIT NO. 14, MARINE CORPS BASE, CAMP LEJEUNE.)

STATE OF NORTH CAROLINA

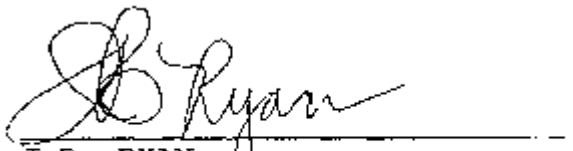
COUNTY OF PENDER

C E R T I F I C A T E

I, J.R. RYAN, CERTIFIED COURT REPORTER-NOTARY PUBLIC, DO HEREBY CERTIFY THAT THE FOREGOING 34 PAGES CONSTITUTE A TRUE AND CORRECT TRANSCRIPT OF THE PRESENTATION, QUESTIONS AND COMMENTS HEARD AT THE PUBLIC MEETING REGARDING OPERABLE UNIT NO. 14, MARINE CORPS BASE, CAMP LEJEUNE.

I DO FURTHER CERTIFY THAT I AM NOT COUNSEL FOR, OR IN THE EMPLOYMENT OF ANY OF THE PARTIES, NOR AM I FINANCIALLY INTERESTED IN THE RESULTS OF THIS ACTION.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS 12TH DAY OF JULY 1998.



J.R. RYAN
NOTARY PUBLIC FOR THE STATE OF NORTH CAROLINA

MY COMMISSION EXPIRES: JANUARY 8, 2002

ATTACHMENT C

SOIL TO GROUNDWATER SCREENING LEVEL CALCULATIONS

SUMMARY OF USEPA EXCEEDENCES OF
SOIL TO GROUNDWATER SOIL SCREENING LEVELS
SITE 69
MCB CAMP LEJEUNE, NORTH CAROLINA

Groundwater COC	Soil to Groundwater Screening Level (mg/kg)	Surface Soil			Subsurface Soil		
		Maximum Concentration (mg/kg)	Frequency	Number of Detections Above Screening Level	Maximum Concentration	Frequency	Number of Detections Above Screening Level
1,2-Dichloroethene (total)	0.785[2]	0.004J	1/25	0	0.002J	1/20	0
Trichloroethene	0.082	0.003J	1/25	0	ND	0/20	0
Beryllium	3.2	ND	0/25	0	0.36	1/10	0
Chromium([1])	1	3.6 (1.6 min.)	18/25	18	17.7 (1.76 min.)	8/10	8
Lead	NA[3]	12.5	25/25	--	6	10/;10	--
Manganese	NA[3]	15.5	22/25	--	39	10/10	--
Vanadium	110	5.3	3/25	0	22.6	4/10	0
Zinc	130.6	66	12/25	0	13.7	3/10	0

Notes:
(1) The soil to groundwater screening level was calculated for chromium VI.
(2) This is the lowest soil to groundwater screening level of cis- and trans- 1,2-dichloroethene.
(3) A soil to groundwater screening level could not be calculated because there is no soil-water partition coefficient (Kd) for this contaminant.
ND = not detected
J = estimated value

USEPA SOIL SCREENING GUIDANCE
CALCULATION OF SITE-SPECIFIC
SOIL TO GROUNDWATER SCREENING LEVELS FOR ORGANICS
SITE 69
MCB CAMP LEJEUNE, NORTH CAROLINA

Equation: $C_{soil} = C_{GW} K_s + \left[\frac{(n_w + n_a H')}{P_b}\right] df$

Soil Screening Levels (ug/kg)	
1,2-Dichloroethene (total)	785
Trichloroethene	82

Calculation Input Table

Definition	Units	Value	Source
C_{soil} - Calculated soil concentration for soil	mg/kg	--	Calculated
$_{CGW}$ - Applicable groundwater target concentration	mg/L		NC 2L Standard
1,2-Dichloroethene (total)		0.07	
Trichloroethene		0.0028	
df - Dilution Factor	unitless	1	
K_s - Soil- water partion cofficient	L/kg	$K_s=K_{oc}$x f_{oc}	--
1,2-Dichloroethene (total)		11.005	
Trichloroethene		29.233	
K_{oc} - Soil organic carbon-water partion coefficient	L/kg		USEPA 1996, Soil
1,2-Dichloroethene (total)		35.5	
Trchloroethene		94.3	
f_{oc} - Fraction organic carbon in vadose zone soil	g_{carbon}/g_{soil}	0.31	site specific value
n_w - Water filled soil porosity (vadose zone soil)	L_{water}/L_{soil}	0.3	See "K_{oc}" Source
n_a - Air filled soil porosity (vadose zone soil)	L_{air}/L_{soil}	0.13	See "K_{oc}" Source
H' - Henry's Law Constant	unitless		See "K_{oc}" Source
1,2-Dichloroethene (total)		0.167	
Trichlorethene		0.37392	
P_b - Bulk Density	kg/L	1.51	OU

Note: Chemical/physical properties of cis-1,2-dichloroethene were used as surrogate values for 1,2-dichlorothene (total).

USEPA SOIL TO GROUNDWATER SCREENING GUIDANCE
CALCULATION OF SITE-SPECIFIC
SOIL SCREENING LEVELS FOR INORGANICS
SITE 69
MCB, CAMP LEJEUNE, NORTH CAROLINA

Equation: $C_{soil} = C_{GW} \left[Kd + \frac{(n_w + n_a H')}{P_b} \right] df$

Soil Screening Levels (mg/kg)	
Beryllium	3.2
Chromium (VI)	1.0
Lead	NA
Manganese	NA
Vanadium	110.0
Zinc	130.6

Calculation Input Table

Definition	Units	Value	Source
C_{soil} - Calculated soil concentration for soil	mg/kg	--	Calculated
C_{GW} - Applicable groundwater target concentration	mg/L		
Beryllium		0.004	MCL
Chromium		0.05	NC 2L Standard
Lead		0.015	NC 2L Standard
Manganese		0.05	NC 2L Standard
Vanadium		0.11	Site Specific Risk - Ingestion
Zinc		2.1	NC 2L Standard
df - Dilution Factor	unitless	1	
Kd - Soil- water partion cofficient	L/kg		USEPA 1996, Soil
Beryllium		790	
Chromium (VI)		19	
Lead		NA	
Manganese		NA	
Vanadium		1000	
Zinc		62	
n_w - Water filled soil porosity (vadose zone soil)	L_{water}/L_{soil}	0.3	See "K_d" Source
n_a - Air filled soil porosity (vadose zone soil)	L_{air}/L_{soil}	0.13	See "K_d" Source
H' - Henry's Law Constant	unitless	0	See "K_d" Source
P_b - Bulk Density	kg/L	1.51	OU

Note: NA = value not available.

Original LUCIP Date: June 2000
Last Revised: June 2000

LAND USE CONTROL IMPLEMENTATION PLAN (LUCIP)
MCB CAMP LEJEUNE OU NO. 14 (SITE 69)
RIFLE RANGE CHEMICAL DUMP

GENERAL

By separate Memorandum of Agreement dated May 24, 1999, hereinafter referred to as the Land Use Control Assurance Plan (LUCAP), the U.S. Environmental Protection Agency (USEPA); the North Carolina Department of Environment and Natural Resources (NCDENR); and the Department of the (Navy) on behalf of U.S. Marine Corps Base, Camp Lejeune, agreed that the Navy and the United States Marine Corps (Marine Corps) shall follow certain procedures for implementing and maintaining site-specific land use controls. Those procedures are contained in the LUCAP, and, for Site 69, this Land Use Control Implementation Plan (LUCIP). The LUCAP is intended to ensure that all of the Department of the Navy's site-specific selected remedies with land use controls remain protective of human health and the environment. This LUCIP and its requirements are part of the selected remedy within the final Record of Decision (ROD).

The parties to the LUCAP also agree that efficacy/protectiveness of the land use controls within this Land Use Control Implementation Plan is contingent upon the Navy's substantial good-faith compliance with those procedures applicable to the selected remedy. Should such compliance not occur or should the LUCAP be terminated, the parties agree that the protectiveness of the selected remedy may be reconsidered by any party and additional remedial measures may be necessary to ensure the selected remedy remains protective of human health and the environment.

This document is the LUCIP for MCB Camp Lejeune, Site 69, Rifle Range Chemical Dump. Site 69 is the sole site comprising Operable Unit (OU) No. 14. This LUCIP is an attachment to and a part of the ROD for the site.

The Navy and the Marine Corps will, Pursuant to the LUCAP, include the land use controls set forth in this LUCIP within the Installation's Geographic Information System (GIS) and the base master planning process. Pursuant to the LUCAP paragraph IV. a)., the Installation will provide written notification to the State and USEPA when the requirements of this paragraph have been met.

All proposed changes to this LUCIP will be submitted to the State and USEPA for review and concurrence prior to implementation. Changes to this LUCIP will, if required under the National Contingency Plan, be reflected in changes to the selected remedy made through the appropriate process (e.g., Explanation of Significant Differences, ROD amendment).

The parties agree that the Navy's annual certification of land use control implementation is necessary for as long as the Navy retains ownership of the site. The NCDENR maintains this annual certification is part of the selected remedy. The Navy and Marine Corps maintain this annual certification is a procedure to implement the selected remedy and is not a part of the selected remedy. Nevertheless, all parties agree that a written certification is desirable. Accordingly, pursuant to the LUCAP paragraph V. b)., MCB Camp Lejeune will provide that certification annually to USEPA and the NCDENR that the land use controls within the ROD remain implemented.

SITE BOUNDARY IDENTIFICATION

The geographic boundary of the site is identified in Figure D-1, Boundary of Site 69. This boundary indicates the outermost border of all controlled portions of this site (i.e., no areas subject to land use controls lie outside this boundary). The current boundary is driven by aquifer use controls.

The geographic boundary of the current shallow groundwater contamination is identified in Figure D-2, Boundary of Current Shallow Groundwater Contamination. The geographic boundary of the current deep groundwater contamination is identified in Figure D-3, Boundary of Current Deep Groundwater Contamination.

SITE USE CONTROLS

Unless specifically excepted by both NCDENR and USEAP, all land uses and intrusive activities at the site (e.g. training, recreation, construction, grading, excavation of soil, or insertion of objects into the ground), except for monitoring purposes, are prohibited. See Figure D-4, Boundary of Land Use Controls. All exceptions for intrusive activities (including intrusive activities for monitoring purposes) are required to have assistance from an Army Technical Escort Unit (or equivalent) to monitor for potential encounters with buried CWM. These controls are to remain in effect until either (a) it can be demonstrated that contaminants (including CWM) no longer remain on site, or (b) the land use controls of this Interim ROD are superceded by a Final ROD.

AQUIFER USE CONTROLS

Except for monitoring purposes or as specifically excepted by NCDENR or the USEPA, all use of groundwater beneath Site 69 is prohibited. In addition, the installation of any well, other than those constructed for monitoring purposes, is prohibited except as authorized by North Carolina Administrative Code Title 15A, Chapter 2C (as amended), Well Construction. See Figure D-5, Boundary of Aquifer Use Controls. A 1,000-foot buffer around areas of known contamination is used to delineate this boundary. These controls are to remain in effect until either (a) it can be demonstrated that contaminants 9including CWM) no longer remain on site, or (b) the aquifer use controls of this Interim ROD are superceded by a Final ROD.

SITE ACCESS CONTROLS

Access to Site 69 is controlled via a chain link fence and locking gate. The fence is currently installed along the perimeter of the Site 69 boundary of land use controls. Warning sings are posted on the fence, gate, and signs will be maintained as long as land use controls are required.

NOTIFICATION

Following the procedures contained within the LUCAP, MCB Camp Lejeune shall file a Notification of Inactive Hazardous Substance or Waste Disposal Site meeting the requirements of NCGS 130A-310.8

ATTACHMENT D
LAND USE CONTROL IMPLEMENTATION PLAN (LUCIP)

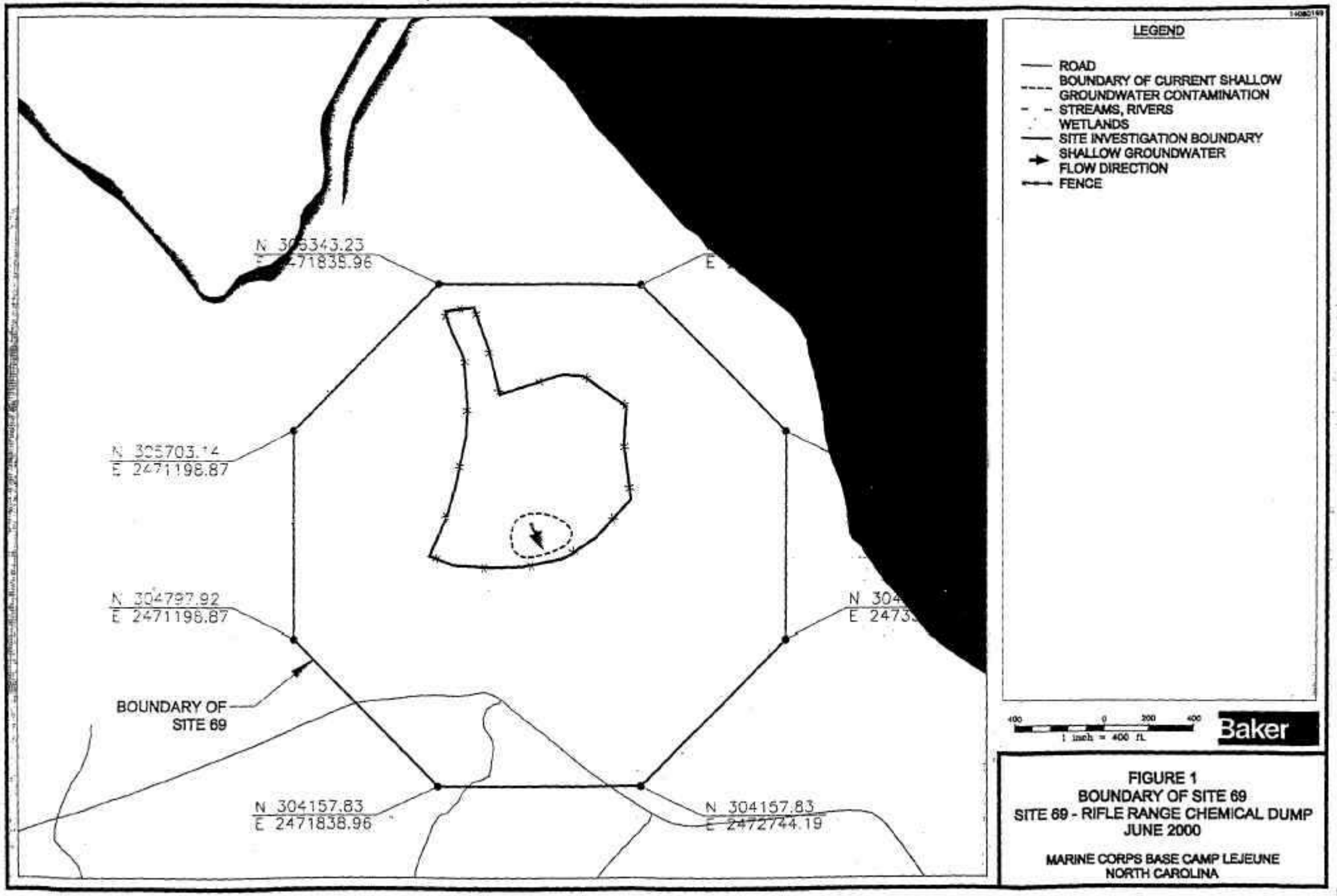


FIGURE 1
BOUNDARY OF SITE 69
SITE 69 - RIFLE RANGE CHEMICAL DUMP
JUNE 2000

MARINE CORPS BASE CAMP LEJEUNE
NORTH CAROLINA

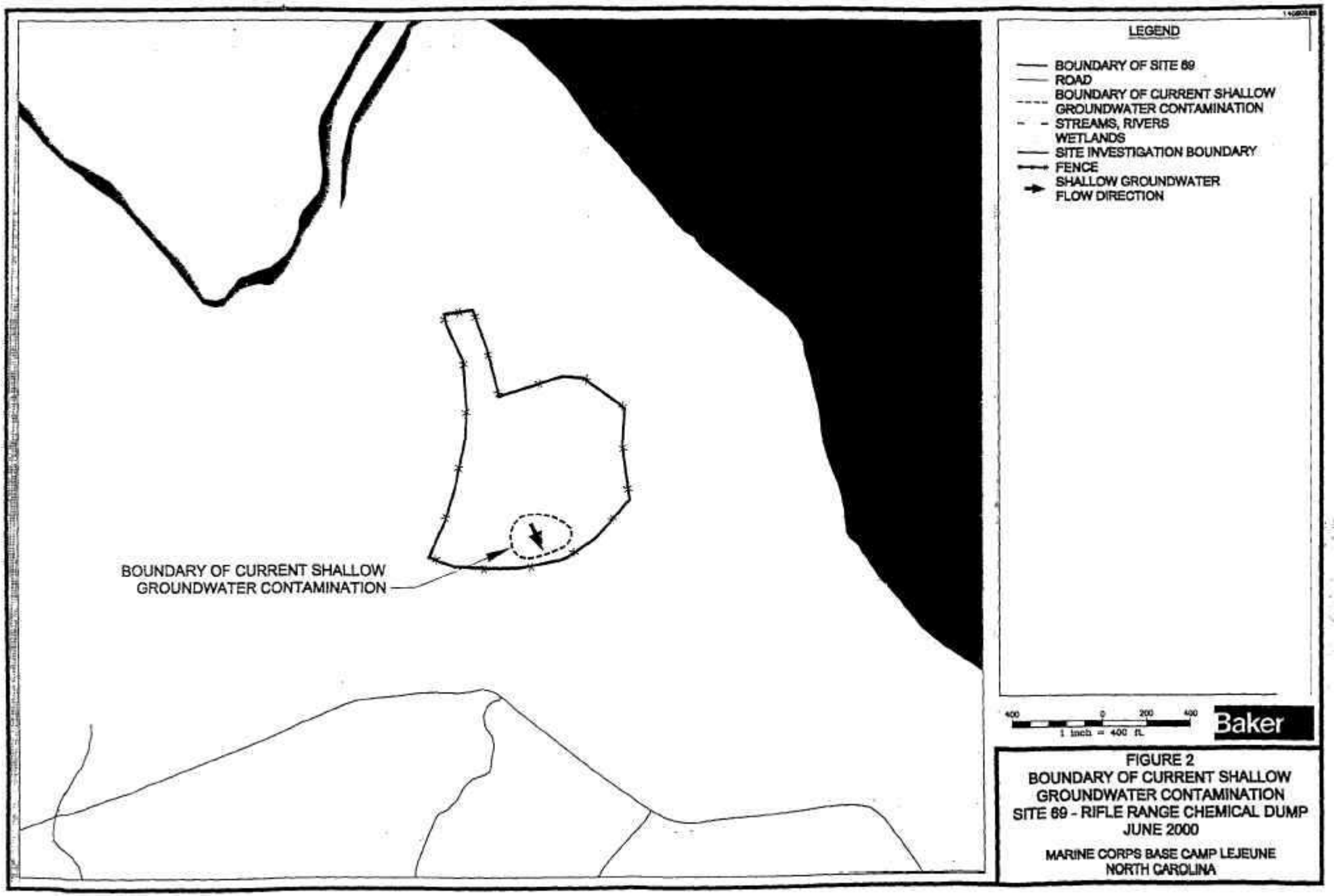


FIGURE 2
BOUNDARY OF CURRENT SHALLOW GROUNDWATER CONTAMINATION
SITE 69 - RIFLE RANGE CHEMICAL DUMP
JUNE 2000

MARINE CORPS BASE CAMP LEJEUNE
NORTH CAROLINA

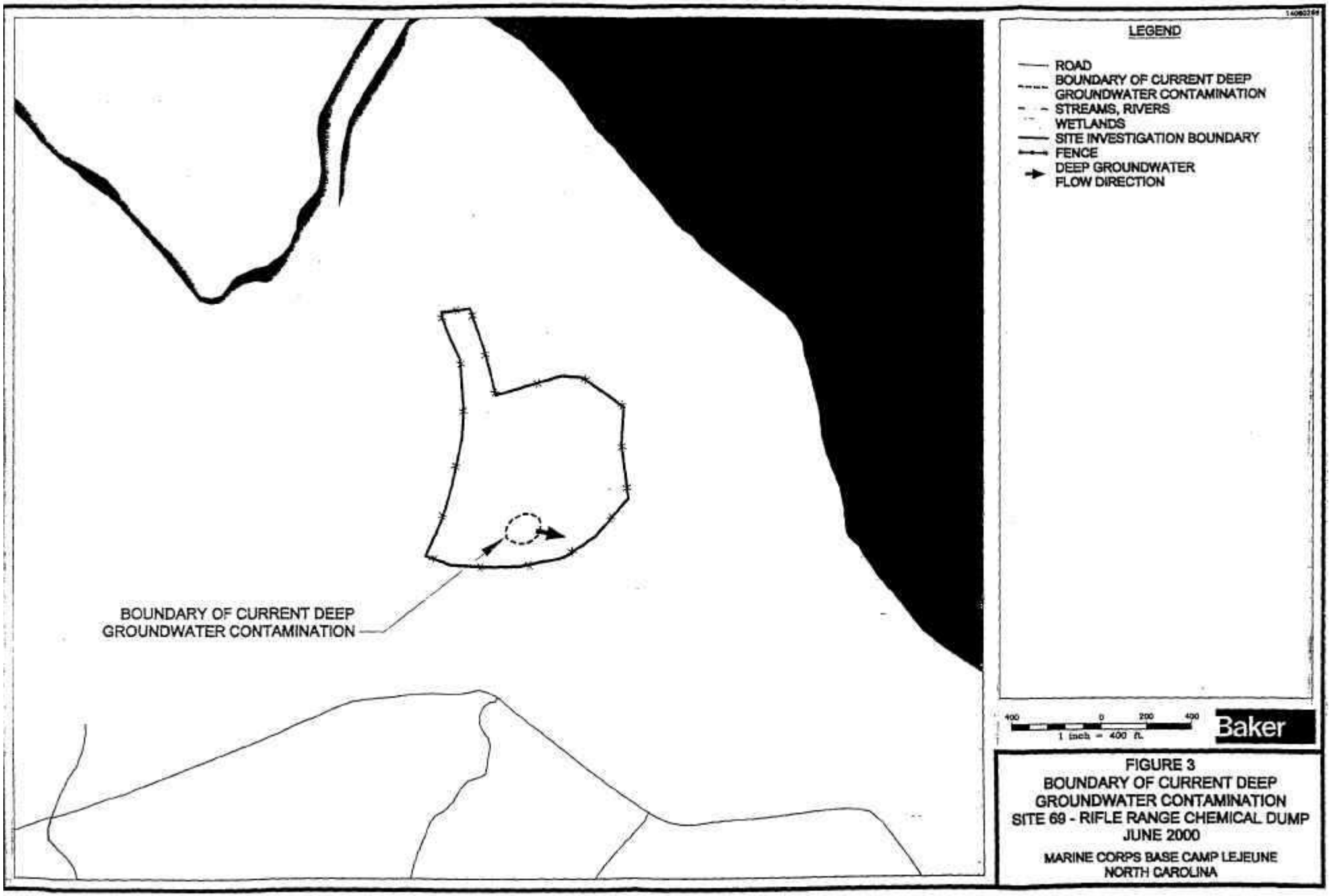


FIGURE 3
BOUNDARY OF CURRENT DEEP
GROUNDWATER CONTAMINATION
SITE 69 - RIFLE RANGE CHEMICAL DUMP
JUNE 2000

MARINE CORPS BASE CAMP LEJEUNE
NORTH CAROLINA

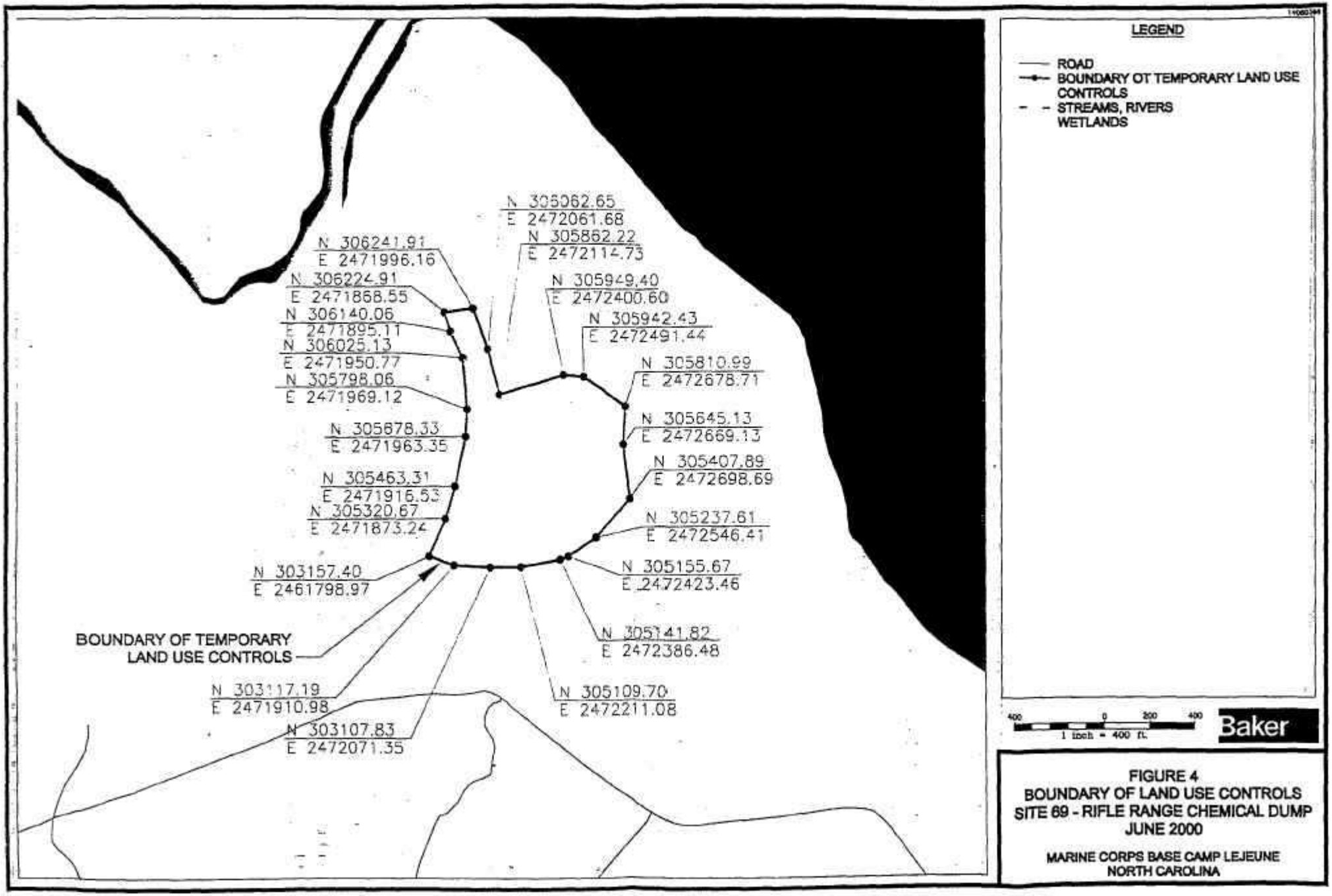


FIGURE 4
BOUNDARY OF LAND USE CONTROLS
SITE 69 - RIFLE RANGE CHEMICAL DUMP
JUNE 2000

MARINE CORPS BASE CAMP LEJEUNE
NORTH CAROLINA

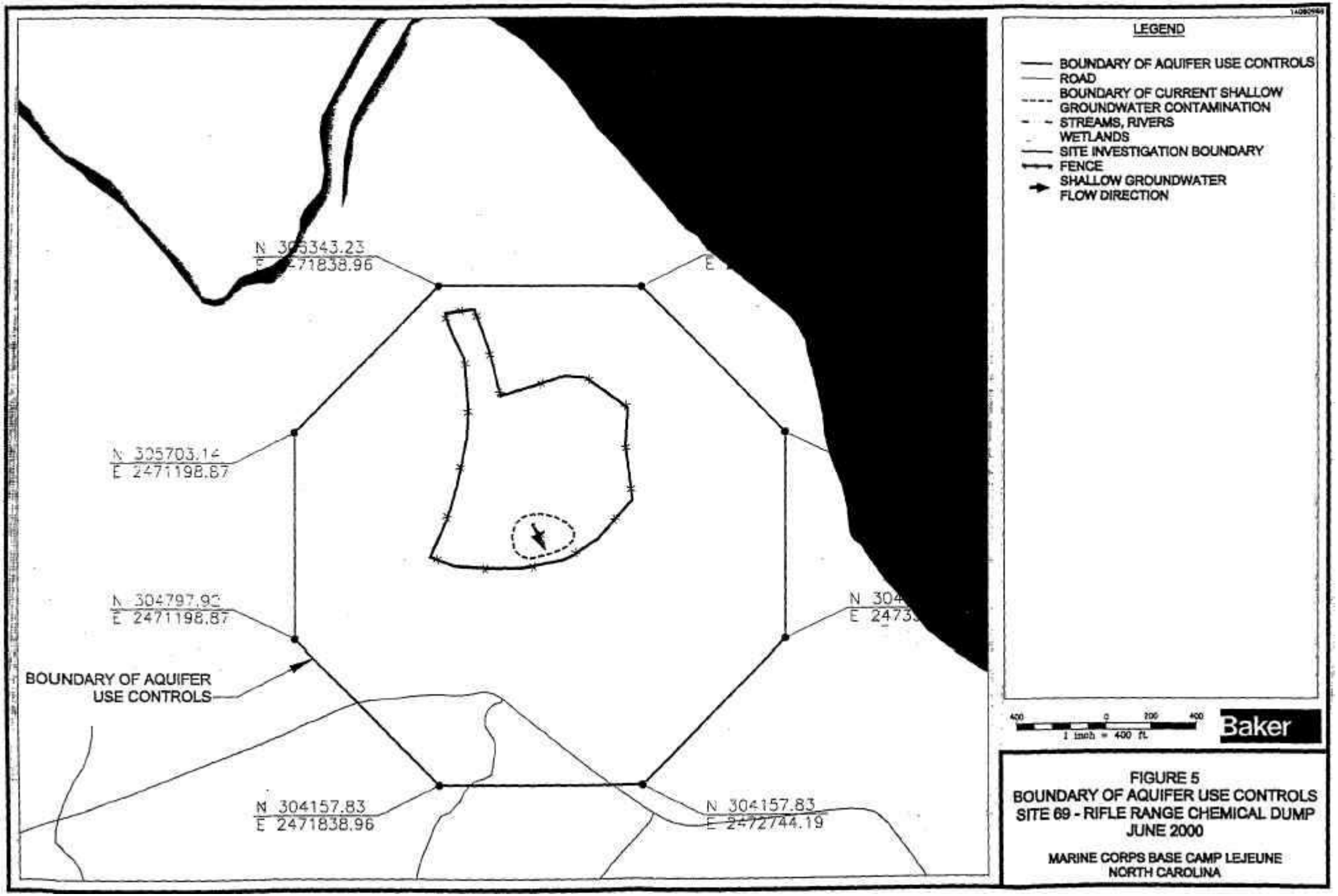


FIGURE 5
BOUNDARY OF AQUIFER USE CONTROLS
SITE 69 - RIFLE RANGE CHEMICAL DUMP
JUNE 2000

MARINE CORPS BASE CAMP LEJEUNE
NORTH CAROLINA

ATTACHMENT E

STATE OF NORTH CAROLINA APPROVAL LETTER

NCDENR

JAMES B. HUNT JR.
GOVERNOR

BILL HOLMAN
SECRETARY

VICTOR LEMEYER
DIRECTOR

NORTH CAROLINA DEPARTMENT OF
ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

April 14, 2000

Commander, Atlantic Division
Naval Facilities Engineering Command
1510 Gilbert Street (Building N-26)
Norfolk, Virginia 23511-2699

Attention: Ms. Katherine Landman
Navy Technical Representative
Code 1823

Commanding General
Marine Corps Base
PSC Box 20004
Camp Lejeune, NC 28542-0004

Attention: AC/S, EMD/IRD

RE: State Concurrence on the
Interim Record of Decision (ROD)
Operable Unit No. 14 (OU14), Site 69
MCB Camp Lejeune, North Carolina

Dear Ms. Landman:

The North Carolina Superfund Section has reviewed the Interim ROD for OU14, Site 69 and concurs with the remedy subject to the following conditions:

1. Our concurrence on the Interim ROD and of the selected remedy for the site is based solely on the information contained in the ROD. Should we receive additional information that significantly affects the conclusions or remedies contained in the ROD, we may modify or withdraw this concurrence with written notice to the Navy and MCB Camp Lejeune.

2. Our concurrence on the Interim ROD in no way binds the State to concur in future decisions or commits the State to participate, financially or otherwise, in the cleanup of the Site. The State reserves the right to review, comment, and make independent assessments of all future work relating to this Site.

We appreciate the opportunity to review this ROD and look forward to working with MCB Camp Lejeune, the Navy, and EPA to remediate this Site.

Sincerely,

Grover Nicholson, Head
Federal Facilities Branch
Superfund Section

cc: Gena Townsend, US EPA Region IV
Neal Paul, MCB Camp Lejeune

1646 MAIL SERVICE CENTER, RALEIGH, NORTH CAROLINA 27699-1646
401 OBERLIN ROAD, SUITE 150, RALEIGH, NC 27605
PHONE 919-733-4996 FAX 919-715-3605